The Electrical Industry's Weekly Magazine

October 10, 1960

Electrical World

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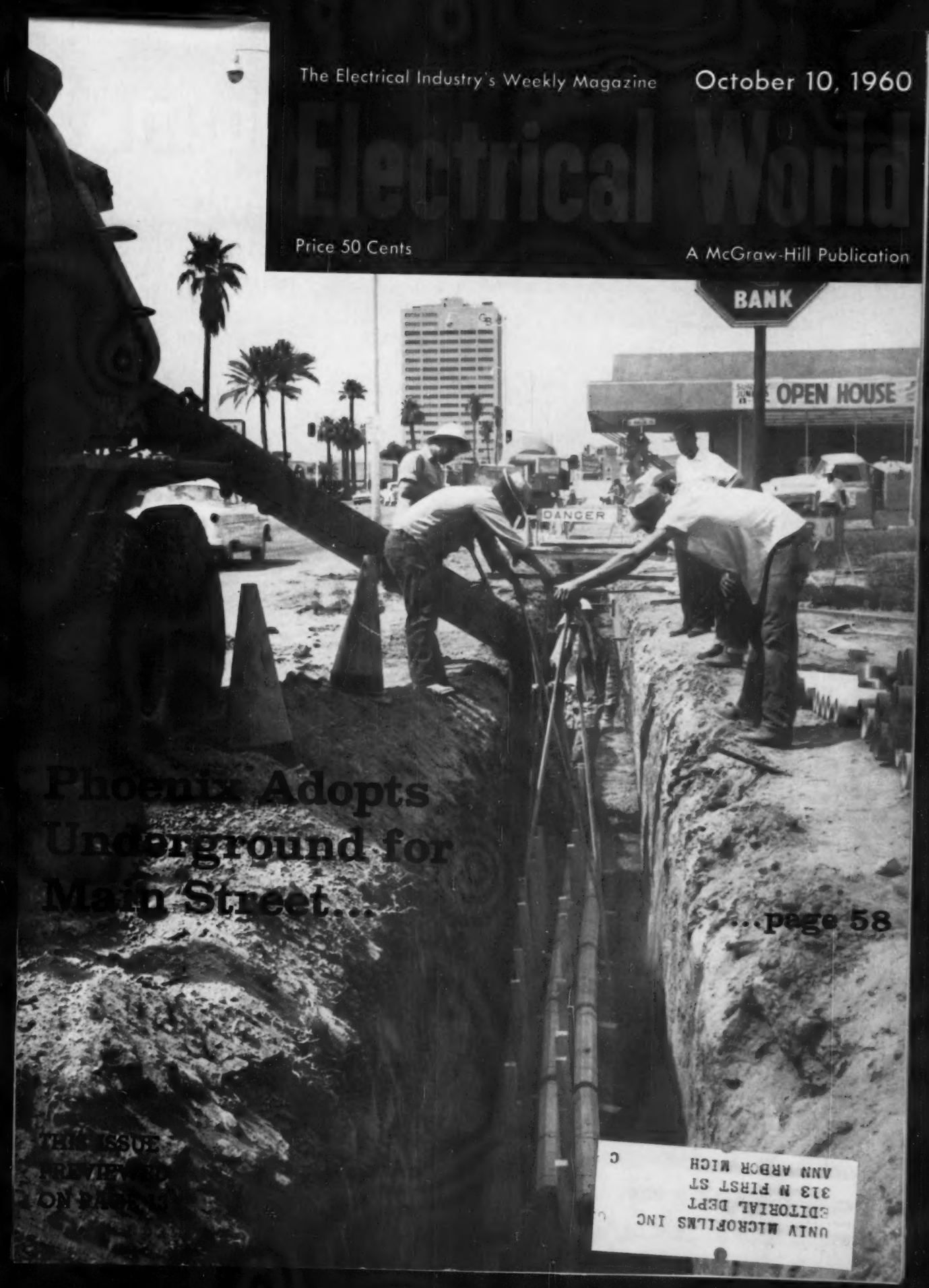

Phoenix Adopts Underground for Main Street...

...page 58

THIS ISSUE
PREVIEWED
ON PAGE

UNIV MICROFILMS INC
EDITORIAL DEPT
313 N FIRST ST
ANN ARBOR MICH

21 Years Underground

—and still as good as new!

21 years ago, the **Niagara Mohawk Power Company** specified Burndy MOLEs for their underground modernization program. Specifications called for a connector that would perform without fault, under prolonged exposure to dampness, oils, extreme temperatures, and last the life of the cables connected. The MOLEs met all specifications, and are as good as new today ... proof beyond doubt that Burndy MOLEs have the high quality necessary for underground systems.

Utilities thruout the country have had similar long years of trouble-free experience with the MOLE ... experience that proves that the MOLE meets underground specifications for maximum dependability.

If you are considering "going underground", or expanding your present system don't take a chance on costly burnouts and disrupted service, call your local Burndy representative ... he has had years of underground experience and can help you get maximum dependability and flexibility in your underground system.

Photo from Niagara Mohawk Power's file, dated 1938, showing actual installation of MOLE in its underground system. These same MOLEs are in operation today, after 21 years of trouble-free performance.

BURNDY

59-19

ELECTRICAL CONNECTORS

Norwalk, Connect. In Europe: Antwerp, Belgium Toronto, Canada

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

OCTOBER 10, 1960

Vol. 154, No. 15

Electrical What in the World . . .

Supply Lines was born only Sept. 26, but already it's become a lusty, demanding child. While yet in gestation, it was assigned a position in the front yellow section of *Electrical World* (this issue, p 15).

This new feature was designed for interpretative treatment of anything relating to electric utility procurement of tangibles: apparatus, materials, supplies. This area always has been vital to utility executive, engineering, operating and purchasing management. So the question comes easily:

If the subject matter is so hot, why wasn't it given up-front treatment before? Glad you asked.

Only fairly recently, we believe, has the American "modified free enterprise economy" begun to function somewhat as it was designed to. Not since FDR's day has it had the chance. Dex Keezer, McGraw-Hill's respected economics consultant, terms this new era the "age of abundance," and there's certainly abundance of everything—including manufacturing capacity for utility apparatus.

This has brought a new effervescence to the utility procurement marketplace. Right now, it might better be described as a violent boiling, with the aromas given off not pleasing to many of the cooks.

Supply Lines, we hope, will be able to serve you well by digging beneath the turbulence immediately visible—to help you in your understanding of what makes the foam and noise on top.

Chuck Hochgesang

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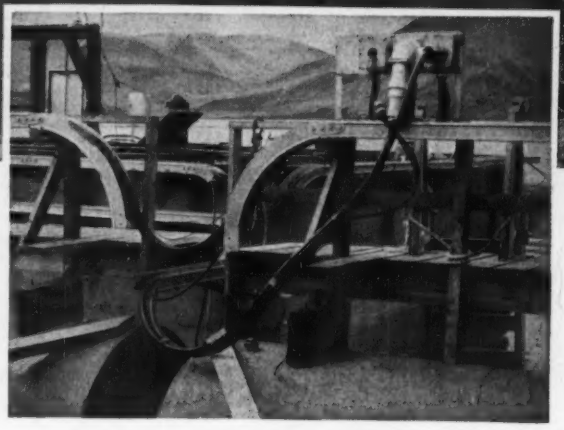
THIS IS THE "FISH NET"—stretching more than a half-mile across the reservoir behind Idaho Power Company's Brownlee Dam in the Hells Canyon reach of the Snake River, bordering Idaho and Oregon. The migrant fish facility, designed to save salmon and steelhead from a drop over the spillway of the 395-foot-high Brownlee Dam, depends on Okolite-Okoprene 600-volt power and control cable for continuous, all-weather operation. Fish trapped at three skimmer-barges attached to the net are taken by specially designed trucks for release down-river.



HERE IS CABLE'BILITY on the job, providing power to two 21,000-gallon-per-minute pumps which create artificial currents that lure the fish into channels in the trap. Multi-conductor control cable also enables a complicated maze of control equipment—almost completely automated—to be operated both from the barges and a shore station.

Cable'bility at work

Idaho Power chooses Okolite-Okoprene cables for power and control at "world's biggest fish net"

Cable'bility (cā'ble·bil'·i·ty) *new word. Noun.* **1.** Ability to design and manufacture electrical cables that give outstanding performance. **2.** Having long background and wide experience in cable research and application. **3.** Possessing keen understanding of customers' problems. Implies eagerness to serve faithfully and dedication to progress. **Syn.** The Okonite Company.

Okolite-Okoprene 600-volt power and control cable is at the heart of Idaho Power's new fish conservation facility behind Brownlee Dam in Hells Canyon, on the Idaho-Oregon border.

The "world's biggest fish net"—300,000 square feet in size behind the giant Snake River dam—depends on nine-conductor Okolite-Okoprene control cables to carry current to almost completely automated control equipment. And Okolite-Okoprene three-conductor power cables provide power to motors driving two 21,000-gallon-per-minute pumps which create artificial water currents, luring fish into channels in the trap.

Both Idaho Power and International Engineering Company, the consulting engineers, specified Okolite-Okoprene for the project, seeking maximum operating dependability. The cables are constantly exposed to weather and, in the center section, are submerged in water. Their flexible stranding helps them withstand the movement of the barges on the lake, as well as handling during removal of barge sections or traps.

For the full story on Okolite-Okoprene, write for Bulletin EW-1085. The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

7228-A

Letters

Growth Percentages Can Mislead

To the Editor:

Electrical World's Management Newsletter (Aug. 15, p 101) has joined the many magazines and writers who have been reporting population trends on a percentage growth basis which places undue emphasis on rather small population increases in such states as Arizona, Nevada, etc.

Actually, the population growth in Nevada and the states immediately adjacent to it was about 2.1 million people during the past decade. The growth in Pennsylvania and immediate adjacent states was exactly the same. Yet the middle Atlantic region is called "slow-growing" while the growth in the West is called "dramatic." The population growth per square mile in this area is considerably larger than in the West. Why should percentage growth be more important than growth per acre?

It seems to me that the real population growth in America continues to be in the areas that already are heaviest populated. Suburbia has been growing and the big cities have lost some of their population but, in general, those people have moved relatively short distances to neighboring suburban developments, not to the wide open spaces of the far West.

W. R. Shope
Box 656
Connellsville, Pa.

Congratulations on Forecast Issue

To the Editor:

Congratulations to *Electrical World* for the fine job of writing and presenting the 11th Annual Electrical Industry Forecast in the Sept. 19 issue. . . .

LeRoy G. Malouf
Education Department
Minneapolis-Honeywell Regulator Co
Wellesley Hills, Mass.

▶This is your column in *Electrical World*. Address correspondence to Letters Editor, Electrical World, 330 W 42nd St, New York 36, N. Y.

Dateline . . .

The Campaign Trail—Sen John Kennedy told the Western States Water & Power Consumers Conference in Billings, Mont., that, "In the face of a growing water shortage, a growing demand for power and a growing threat from Soviet competition, the Republican party has virtually ground to a halt the development of our great natural assets.

"I do not say that only federal funds and federal planning can do the job. State, local and private effort will be needed as well. But we are talking about resources that belong to the public—about rivers that belong to the nation—about projects that are essential to our security."

Kennedy outlined a nine-point program that he would carry out as Democratic President:

(1) "Reverse the policy of 'no new starts' . . . immediately in January, 1961;

(2) "We will not stand by and permit our resources to be taken for partial development for the benefit of special interests. We will not stand by . . . and permit another Hells Canyon blunder . . . The next President of the United States must support early authorization of the Paradise-Knowles multipurpose project;

(3) "We will appoint to the FPC, REA, Interior Department . . . men who will put the public interest first;

(4) "We will establish a council of resources and conservation advisors in the office of the President, to coordinate planning in this field . . . We need a national as well as a local or regional view—planning, for example, how we might profitably link the power systems of the Columbia and Missouri Rivers —and deciding where public and cooperative power systems require steam as well as hydro plant;

(5) "We shall develop more business-like budget practices—which distinguish between capital investment and operating expenditures—instead of a

(*Continued on page* 52)

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HERE! CHEVY'S CORVAIR 95 CORVAN

■ Workshop and warehouse under one roof! Here's a truck with all the earmarks of an ideal installation, repair or cable splicing vehicle. The new Corvan is only 68½" high on a trim 95" wheelbase, but inside you'll find all the space you need. The load compartment area is 109" long, 60" wide and 54" high at the center; designed to handle 1,800 pounds worth of equipment, tools and materials. That's more load space than you'll find in a conventional half-ton panel.

■ Easy to handle, easy to load! Fifty-fifty weight distribution front and rear, loaded or unloaded, and 4-wheel independent suspension account for the Corvan's remarkable light-handed steering and stability. The cab's roomy; visibility is exceptionally good with no hood between the driver and the road. And you find this one practically loads and unloads itself. Those side doors open a full 49" wide, with loading height a low 14". Rear end loading height is only a shade over two feet.

■ Low-cost performance of an air-cooled rear engine! Tucked neatly under the rear load compartment is a "pancake" type 6-cylinder engine made almost entirely of aluminum. Its efficient horsepower to pound ratio contributes significantly to its operating economy. And because the engine is air cooled, you never have to buy antifreeze. No water is ever used. You can count on quick warmup, a special advantage in daily stop-and-go service. A 3-speed Synchro-Mesh transmission is standard with a 4-speed gear box or Powerglide automatic transmission optional at extra cost.

■ Parts and service as near as your Chevrolet dealer's. That's sure to be near, too, with well over 7,000 dealers in the land and Chevrolet parts warehouses located across the country from coast to coast. You can count on keeping your Corvan units always fit and on the job—an especially important consideration in your line of work.

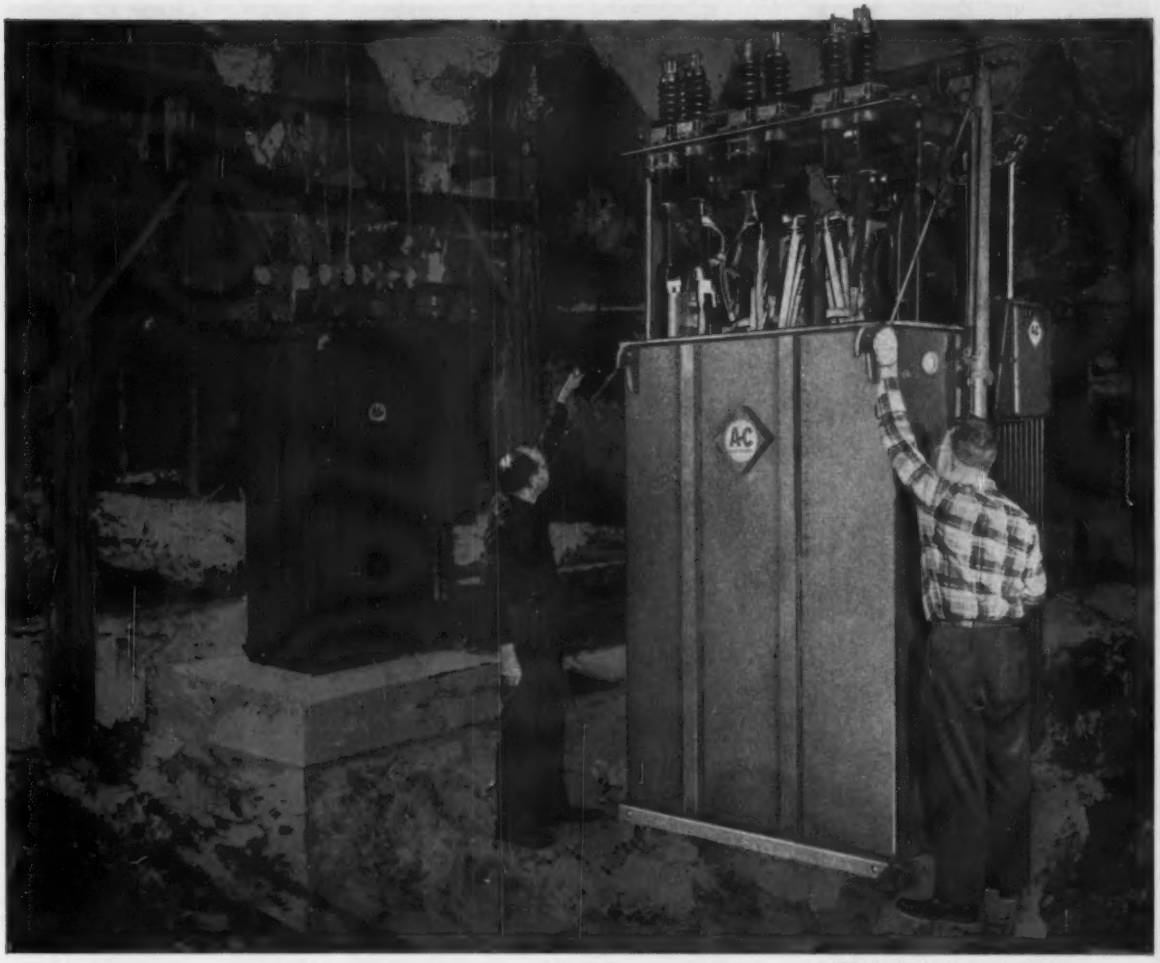
There are two Corvair 95 pickups also; one has an ingenious swing-down side loading ramp. Maybe that's your truck. At any rate your Chevy dealer can tell you about all of them. He's the man to take it from here.... Chevrolet Division of General Motors, Detroit 2, Mich.

CHEVROLET

More load space, less road space, from a truck that practically pays for itself in savings!

ALLIS-CHALMERS

ORIGINATORS OF 5/8% STEP REGULATORS



SFR Feeder Voltage Regulator

Only exclusive unit construction delivers

extra regulator values you can see

Why is unit construction so important to regulator users? Simply because this design is *basic* to these many other extra-value A-C features *you can see*...advantages you can't find on any ordinary regulator!

You'll see continuous leads passing directly from the coils to the double-bolt terminals on the dial switch.

You'll see 78 fewer bolted connections only unit construction can offer. No leads to disconnect, no terminals to remove when you untank.

You'll see better workmanship, since all connections are securely made and double-checked *before* unit is tanked!

You'll see how much easier inspections can be. To untank, remove cover bolts and control compartment retaining nuts. Then lift entire assembly from the tank... there's no need to remove oil.

Your nearby A-C office has the facts on single and three-phase sizes from 2,400 to 69,000 volts... in ratings up to 2,500 kva. Or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

A-1379

Caliband is an Allis-Chalmers trademark.

CALIBAND control — At the twist of the control knob, you can set or test voltage level and band width without changing voltage or interrupting regulated service.

Another new development using

B.F.Goodrich Chemical *raw materials*

Whitaker Visual Rewiring Cable contains either 4- or 6-conductor 12-gauge wire insulated with Geon, jacketed in a clear Geon. It is manufactured by Whitaker Cable Corporation, North Kansas City, Missouri. B.F.Goodrich Chemical Company supplies the Geon vinyl.

Transparent cable jacket of Geon gives truckers see-through convenience

Designed to meet new ICC truck-trailer wiring requirements that call for higher-capacity electrical circuits, this new cable gives installers real convenience. Conductors insulated in various colors of Geon are contained in a jacket of clear Geon vinyl, so that locating wires for making connections is fast and easy.

At the same time, truckers get top quality electrical protection because Geon gives excellent dielectric properties and good resistance to abrasion, weathering and heat. It is nonflammable, has low temperature flexibility and is extremely inert to oil, chemicals and solvents. Geon retains its properties over years of service.

Here's another example of the way Geon vinyl improves products. For information, write Dept. GX-11, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Geon VINYLS

B.F.Goodrich Chemical Company
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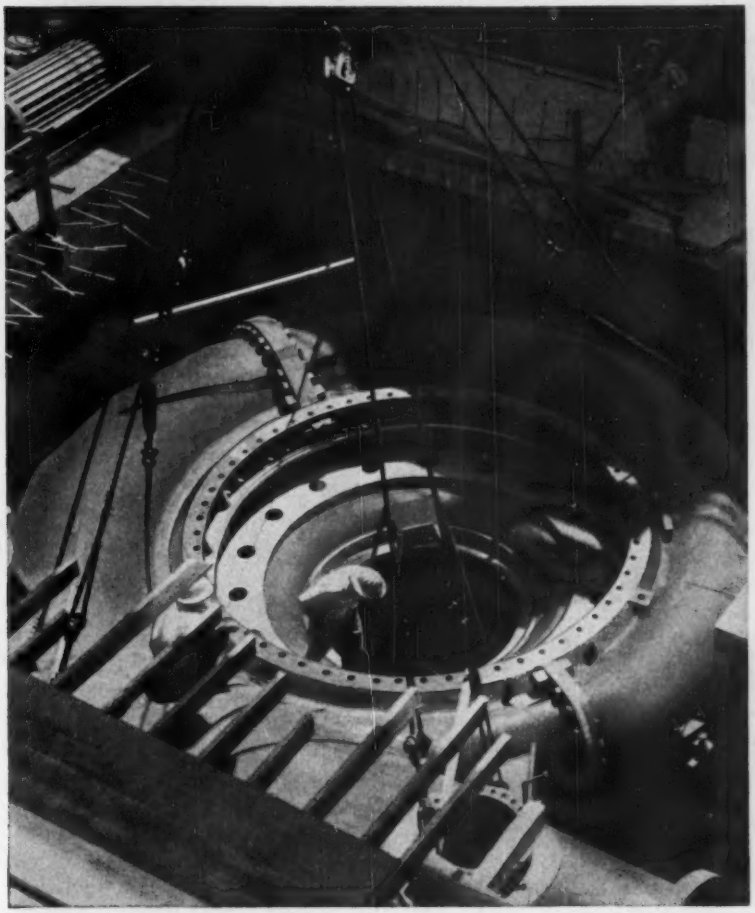
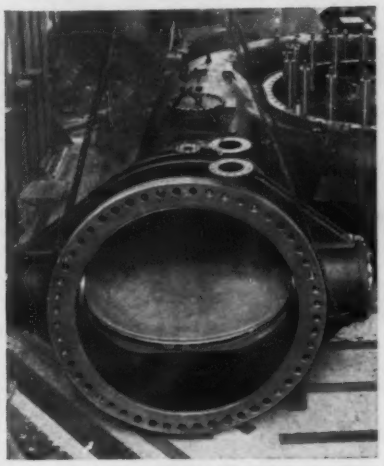
GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

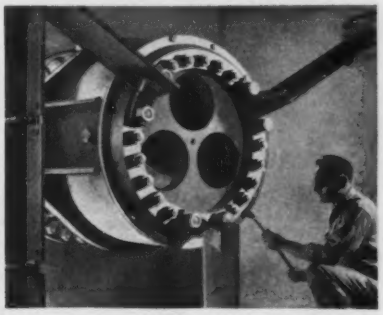
ALLIS-CHALMERS



Spiral case for one of the two A-C Francis turbines at Mammoth Pool (each rated 88,000 hp under 950-ft head at 360 rpm).



Butterfly-type turbine inlet valves—designed for minimum head loss, are bolted directly to 69 inch diameter spiral case inlet flange.



HOWELL-BUNGER valve for pressure relief — one of two 36-inch Allis-Chalmers pressure-regulator valves at Mammoth Pool, in operation under heads exceeding 1000 feet.

Peaking capacity using high-head hydro

...boosts coast utility hydro past the million-kw mark

Two Allis-Chalmers hydraulic turbines installed by Southern California Edison Company at the new Mammoth Pool project operate under a maximum gross head of 1100 feet. After careful consideration of the relative merits of Francis and impulse-type turbines, the Francis type was selected for this high-head installation. Operation of these units as "spinning reserve" required special care in design and manufacture to minimize leakage losses.

Corrosion-resistant wearing plates and gates are precision machined to permit total gate end clearances at assembly of minus nothing to plus 3/1000 of an inch.

Cooling water is piped to the runner seal rings and a complete tailwater depressing system was included by A-C. To facilitate 10-second load rejection and maintenance of minimum downstream flows, A-C supplied two *Howell-Bunger*, free-discharge type, pressure-regulating valves. Two special high head 90-inch butterfly-type inlet valves are provided with corrosion-resistant seals and seat rings adjustable from the outside. A 60-inch *Howell-Bunger* valve and a 72-inch butterfly guard valve are in the reservoir dam outlet works for water release when required.

Look to Allis-Chalmers for engineering, design and manufacture of hydraulic turbines and accessories. *Contact your local A-C office for information or write* **Allis-Chalmers,** *Hydraulic Division, York, Pa.* A-1333

Howell-Bunger is an Allis-Chalmers trademark.

CONVEYOR BELTS

NEW POWER PLANT USES 9 "U.S." CONVEYOR BELTS

Appalachian Power's new Clinch River steam generating plant at Carbo, Va. (started operating September, 1958) uses 9 "U. S." belts in its conveyor system for top automation and economy.

Following the shakeout operation, the coal is conveyed from the hoppers by two U. S. Giant® Feeder Belts (20', 48", 4-ply, 48 oz.). Receiving the feed is a U. S. Giant belt (490', 36", 4-ply, SN cotton-nylon) having a lift of 81 feet. Six other "U. S." belts are used in the system, designed to convey 1,200,000 tons of coal a year.

The U. S. Rubber "Coordinated Engineering" method of providing the right belt for the materials to be conveyed helps explain why "U. S." is the world's leading authority on belts—and explains why "U. S." Belts last longer, save you dollars. "U. S." engineers work with the manufacturers of the conveying mechanism and engineers of the plant, to assure you unfailing dependability.

• • •

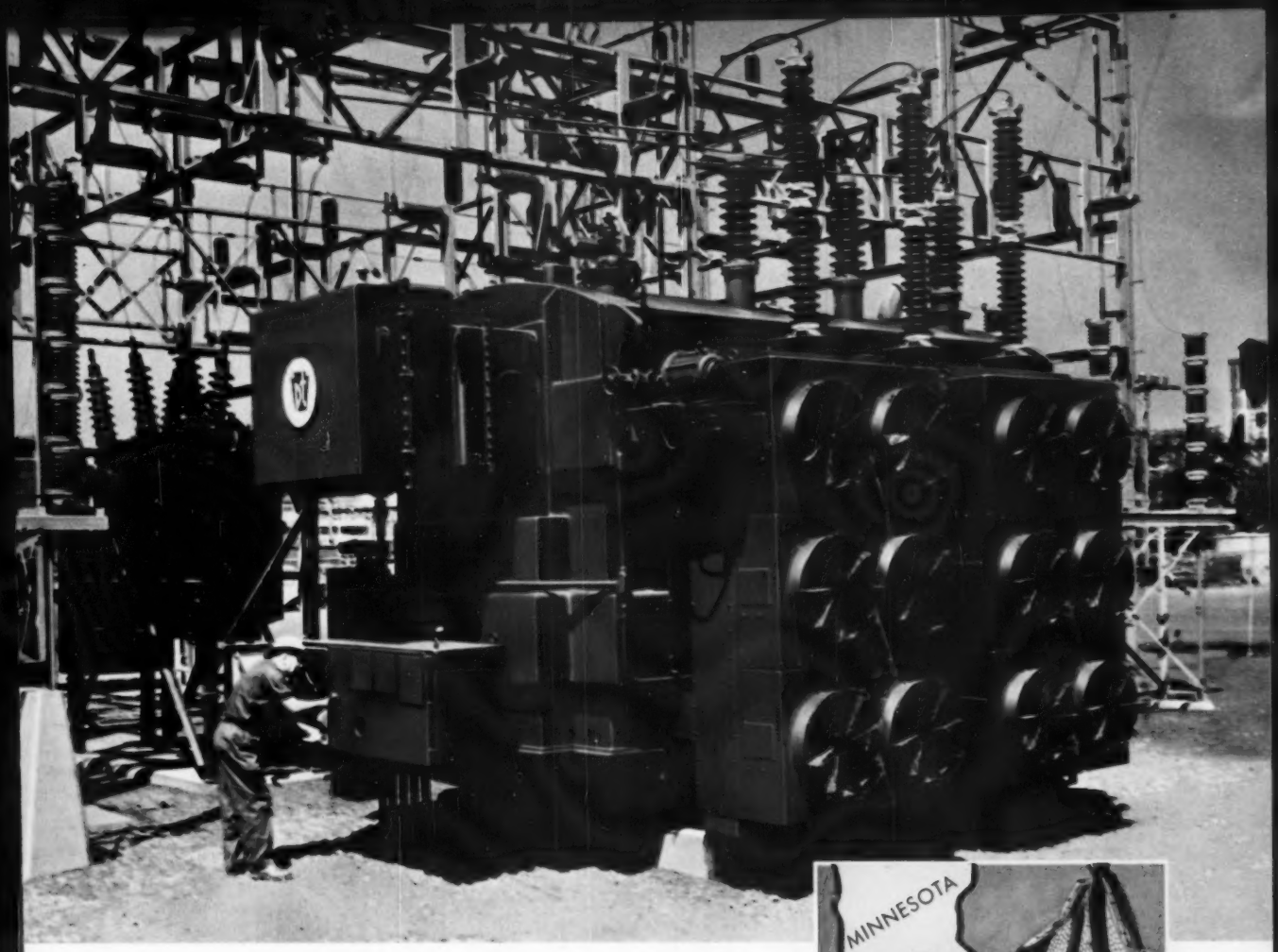
When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.



To "feed" the nation's farm belt . . .
Interstate Power Chose PENNSYLVANIA

50,000-Kva Contour Design LTC Transformer Serves 69-Kv Ring Bus at Dubuque Plant

Now serving nearly 14,000 farms and 250 communities in Minnesota, Iowa and Illinois, the Interstate Power Company has played a major role in the electrification of the nation's farm belt. Throughout the years, Interstate has steadily expanded its facilities to keep pace with the region's increase in population and production. In the most recent expansion, a 33,000-kw generating unit was installed at the Dubuque, Iowa, Power Plant—raising that station's total capacity to 97,000 kw.

A 50,000-kva Pennsylvania Load Tap Changing Transformer plays a key role in the new facilities at Dubuque. It ties one section of the 13.8-kv generator bus to one section of the 69-kv ring bus, which interconnects transmission lines serving Interstate's outlying areas. LTC equipment (for plus or minus 10% regulation in 32 steps) permits separate regulation of voltage on the transmission system and on feeders that supply local load from the generator bus. Some 2400-volt distribution load and auxiliary station service are supplied from the tertiary winding.

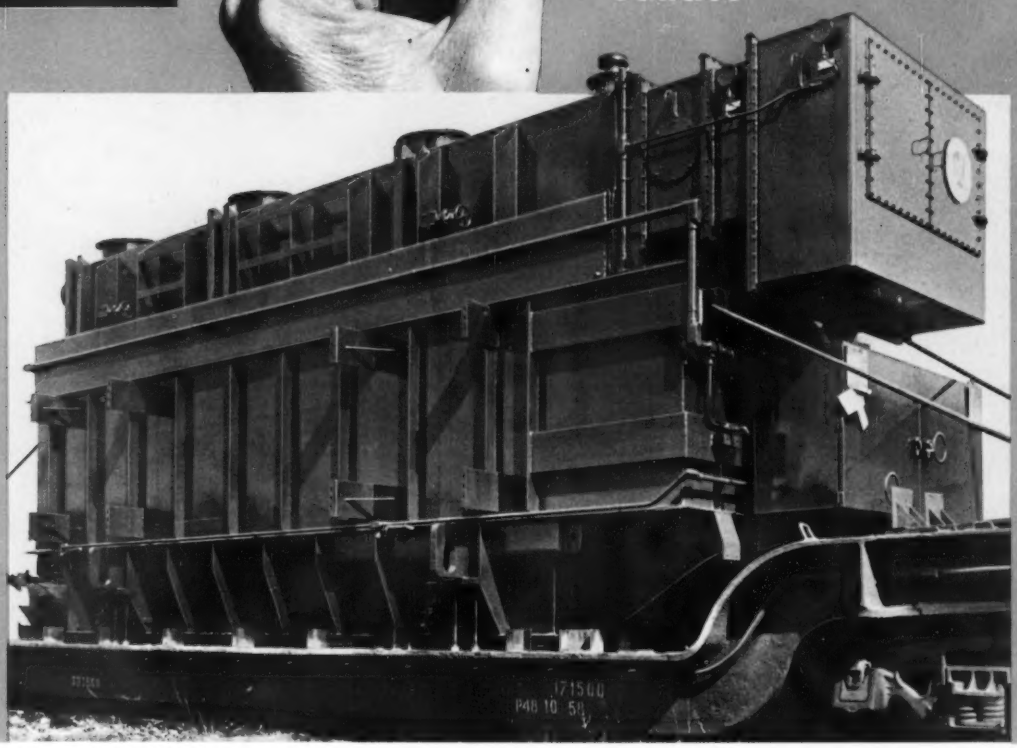
Pennsylvania's shell-form Contour Design permitted the transformer to be shipped to the installation site in an upright position and completely assembled except for external accessories. This is "standard" at Pennsylvania, where similar space-saving, weight-saving practices have been applied to transformers as large as 315,000 kva and to units with voltage ratings as high as 330 kv. Load tap changing equipment is available through 250,000 kva.

For more information or a quotation on specific requirements, contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

PENNSYLVANIA POWER TRANSFORMERS

Turn the page for some facts on facilities

... SIGNED and SEALED for DELIVERY to the Nation's Utilities



Personalized Responsibility Safeguards Quality of Pennsylvania LTC Equipment

At Pennsylvania Transformer, C.A.A.D.—the Control Apparatus Assembly Department—is responsible for *every step* in the manufacture and assembly of load tap changing equipment. To safeguard quality, the department has established a rigid system of controls for every step, from the manufacture of parts to the assembly of LTC equipment on transformers and regulators. Quality control practices include:

1. Checking *all* dimensions of *all* machined parts against designs and standards.
2. Inspecting and writing individual check reports on every subassembly and assembly. By stamping their code initials on assemblies and co-signing reports, assemblers share responsibility, along with the inspectors, for maintaining the highest standards.
3. Conducting extended, automatic, service-simulated test runs of up to 5000 tap changes on every LTC assembly.

Upon the satisfactory completion of these and other quality checks—but not until then—a "PT" seal of approval is applied to driveshaft couplings, limit switch settings and other critical points. This in effect "seals in" the quality by preventing tampering. It is your assurance of less trouble and lower costs—both at installation time and during the long life of Pennsylvania LTC transformers and regulators.

PENNSYLVANIA TRANSFORMER DIVISION

McGRAW-EDISON COMPANY • CANONSBURG, PA. • GREATER PITTSBURGH DISTRICT

See other side for story of a Pennsylvania LTC installation

Electrical World

OCTOBER 10, 1960

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CIRCULAR PLATFORMS make boiler stack work safer . . . Pilot lamp in field-control switch circuit eliminates additional wires to control switch 64

LATE NEWS ▸ **North Little Rock, Ark., eyes** federal power or construction of own generating plant to serve its municipal system after rate dispute with Arkansas P&L. City refuses to pay increase from 7.5 mills to PSC-approved 9.4 mills, claiming increase is illegal.

Portland GE gets $1,575,989 federal tax refund after federal district judge overrules IRS contention that depreciation figures developed by the Oregon PUC could not be used for federal tax purposes. Ruling also says utility could base useful life of some properties on company experience.

Houston P&L asks city council for 13.5% increase in residential rates, 10.4% boost in commercial rates. Company claims request is the first since company started operating in 1882.

Pacific P&L agrees to sell properties in urban renewal area of Springfield, Ore., for $61,000, to municipal system. City also renews negotiations to buy rest of utility's urban properties. Action would require bond election.

Maine PUC authorizes new rates, averaging 3% increase, for 300,000 customers of Central Maine Power. Action follows decision of state Supreme Court, which allowed some exceptions in utility's court appeal on PUC's earlier 2.5%. Utility request, started in 1958, sought about 7.5% boost.

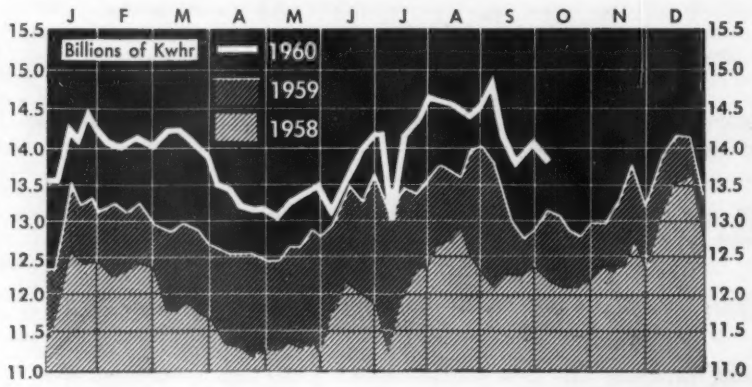
Bureau of Reclamation, in special feasibility report to Congress, recommends construction of 144-Mw, $40-million Crater-Long Lakes hydro project near Juneau, Alaska. Crater-Long Lakes, on Speel River, would be part of Snettisham project.

Investor-owned class A and B utilities boosted operating revenues by 9.2% in 1959, to record $11,128,972,000, says FPC report. Net incomes, up 9% over 1958, hit $1,655,836,000. Total assets rose to $42,212,273,000.

US Appeals Court rules Kentucky Rural Electric Co-op Corp, a statewide organization, cannot accept commissions on equipment purchases for its member co-ops. Kentucky co-op sued Moloney for damages after Moloney cancelled commission payments, which have now been judged a violation of anti-trust laws.

Landslide victory gives Iowa P&L margin of nearly 11 to 1 as Des Moines confirms franchise in special election. Over 15,500 of 17,000 voters approved new 25-year franchise which clears way for new financing by utility.

WEEKLY POWER OUTPUT—Up 4.1% (Week ending Oct. 1), Kwhr 13,779,000,000



Per Cent Change From Previous Year

	Sept. 17	Sept. 24	Oct. 1
Total U. S.	+ 8.8	+ 9.9	+ 4.1
New Eng.	+ 1.5	+ 3.3	+ 1.5
Mid. Atlan.	+ 8.0	+ 4.0	+ 0.1
Cent. Indus.	+ 9.3	+ 6.5	+ 6.2
West Cent.	+12.3	+ 9.6	+ 8.2
Southeast	+ 5.2	+ 7.6	+ 1.7
South Cent.	+12.3	+13.1	− 5.4
Rocky Mount.	+14.2	+15.1	+15.1
Pacific			
NW	+ 4.5	+ 8.6	+ 7.2
SW	+15.9	+15.5	+15.0

Seasonally Adjusted Index 267.3

Week Ago 273.5 Year Ago 248.8

Source: Edison Electric Institute

Supply Lines

NEW ORDERS SLOW, BUT NO CHANGES IN INVENTORY POLICY

Slowdown in orders of transmission and distribution equipment is not easily traced to drastic changes in utility inventory policy. Several manufacturers of such items as insulators, lightning arresters, and the like have reported a slackening in demand in recent weeks. Some manufacturers believe that utility buyers, studying the low price levels, may be holding back in anticipation of still lower prices. A more frequent supposition is that utilities are geared toward another round of inventory trimming.

There have been no recent changes in inventory policies, report five large utilities scattered widely around the country. However, utilities still aim at keeping inventories at a low but safe level. One large Eastern utility is applying a new inventory formula designed to key inventory directly to usage. For a few items, this may reduce normal inventory of the item by as much as 75%. But this particular formula as yet has had relatively little effect on overall inventory. Purchasing executive for another large East Coast utility, while denying any change in inventory policy, notes that the lower-than-expected summer peaks may soon be having some effect on buying. President of a sizable Southwestern utility said there has been "absolutely no cutback in our buying." He reported that industrial growth in his area continues at a rapid pace and utility construction has not slackened despite the rather moderate summer weather in the area.

There was no indication that the price picture is holding back purchases. But one purchasing executive did express the view that in some areas "prices are too low to be healthy for the suppliers." On the other side of the picture, an executive of a smaller Midwest utility opined that prices on most items of equipment appears to be "just about right."

UTILITIES NOT DISTURBED BY GE STRIKE

If utilities were worried about the strike at General Electric Co, they failed to show signs of it last week. A quick check of utilities in selected cities indicated that no preparatory action had been taken to stockpile equipment or to buy ahead. One purchasing executive said he had checked to make sure that deliveries would be made on a few items, but had taken no other action. One or two other utility purchasing agents said they had been led to believe that the strike would not completely shut down GE facilities supplying utility equipment.

Among the equipment that might be affected by the strike are: high, medium, and low voltage switchgear; large and medium power transformers, distribution transformers, wire and cable, gas and steam turbines.

Production and delivery schedules from GE's strikebound plants are far from clear. When *Electrical World* went to press at midweek, GE had issued no statement as to what these schedules might be. There was some question as to how long a strike could continue without a growing "back-to-work" movement. GE has made it very clear to the union that its present offer is "it" no matter how long the IUE strikes. Moreover, the company has rejected any third-party intervention in the strike and is making a determined effort to keep the plants going. As the strike started, only the switchgear plant in Philadelphia was closed up by pickets. At other plants, production and salaried workers crossed the production lines,

but it is still too early to tell whether any meaningful production will come out of these plants.

The strike appeared to harden as the week progressed. All IUE locals except the big one at Schenectady began their walkout Oct. 2. In defiance of the IUE constitution, the Schenectady local stayed on the job until a second strike vote, in the form of individually signed petitions, was taken Tuesday. With a majority vote there, the Schenectady local planned to set up its picket line last Thursday morning.

In Washington, a Thursday meeting was called for the heads of the AFL-CIO's Industrial Union Department which consists of the IUE, UAW, IAM, IBEW, and other unions. Purpose of this meeting was to "implement the strike" against GE. Just how this would be done was uncertain, as the company reports some 75% of GE's IAM-represented employees and some 92% of those in the UAW had previously reached an agreement with the company.

Federal mediators called a second session for Friday of last week between company and union negotiators after a Wednesday meeting made no progress. James B. Carey, IUE president, called the Wednesday session "fruitless." John A. Burke, the federal mediator, said there had been no change in positions by the principals.

While utilities displayed little apparent interest in the strike, one or two utility presidents expressed the hope that GE would not give in to any demands that would "feed inflation" by increasing equipment prices.

EFFECT OF FPC GAS RATES STILL BEING PONDERED

Electric utilities have no quick answer as to how the new Federal Power Commission area rate schedules for natural gas will affect their fuel bills. Most utilities contacted by *Electrical World* indicated they believed the new gas rates would have little immediate effect and they expected little long range effect.

In the Southwest, President Donald Kennedy, Oklahoma Gas & Electric Co, said he would have to study the order before making any final determination. However, he noted that he bought directly from producers in the state and the FPC order was directed at producers selling in interstate commerce. Longer term, of course, the rates on sales to interstate pipelines would affect intra-state sales, he said.

Spokesman for a Louisiana utility noted that the FPC has specifically excepted certain rates in Mississippi and southern Louisiana pending outcome of rates cases now in litigation.

Purchasing man for a Texas utility said that the area rates set by FPC would indicate a lower price for gas than his firm was now paying. However, he said no comprehensive study had been made as to how the FPC action would affect fuel contracts already in force.

In Washington, the Independent Petroleum Assn branded the pricing standards set by FPC as unworkable, and there was an indication that the order would be subjected to a court test. The producers will have to apply the new rates and test cases adjudicated before the full effect of the new rates will be known by utilities.

No fumbling with loose parts

The O-B 88500 Universal clamp has no loose nuts, bolts, washers, or keeper piece for the lineman to worry about. The reason, of course, is that there is no need to remove these parts in the first place.

A special spring clip holds the clamp open while the lineman uses both hands to form and bend the conductor. Then the nuts are tightened on the U-bolts. The clamping job is completed. Installation can be done entirely from one side, with the line hot or dead.

Made of galvanized malleable iron, the 88500 takes the full range of conductors from .20 to .50 inches in diameter. The very design of these clamps give them inherent high holding strength.

It's easy to see how the O-B 88500 clamp simplifies the lineman's job and makes deadending convenient and efficient. Just the time saved in speedy installation could well help pay for the clamps. Why not try them on your next deadending job and see for yourself their many advantages?

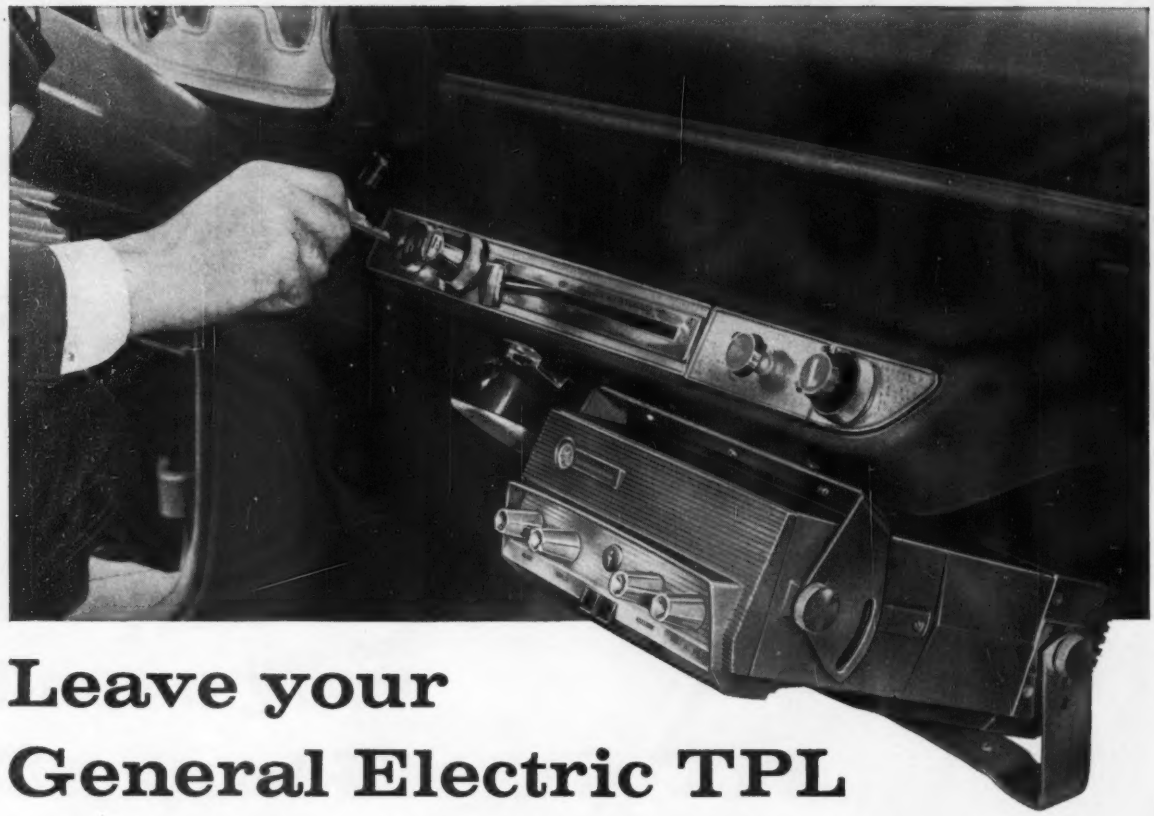
OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

10037-H



Leave your General Electric TPL 2-way radio on while your engine is off!

LOWEST BATTERY DRAIN AVAILABLE

Other makes of mobile radio drain your battery severely, even on standby. Unless you keep the engine running, this will inevitably shorten the life of your battery. And if you *do* run the engine while your vehicle is standing still, you're letting yourself in for a whole series of other problems—increased gas consumption, increased engine wear, special generators, etc.

Not so with TPL! Standby battery drain on General Electric's new Transistorized Progress Line is so low you need never turn off the TPL unit in your vehicle. By actual measurement, drain is less than 40 milliamperes, or only 1/25 of the current that runs your dome light. And even when the receiver is talking, drain is only 540 milliamperes.

With only four tubes in the TPL transmitter, you require no special generator, use less gas and need fewer engine jobs. The cost of operating your two-way radio system goes way, way down.

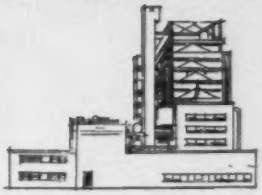
Get the full story on TPL—the smallest, most reliable two-way radio you can buy today. Write General Electric Company, Communication Products Dept., Sect 9100-10, Mountain View Road, Lynchburg, Virginia.

GENERAL ELECTRIC

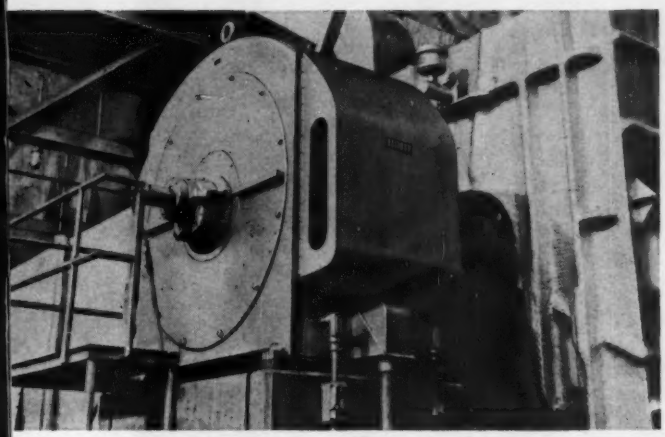
Here's another Elliott Record!

8 YEARS OF TROUBLE-FREE SERVICE...OUTDOORS

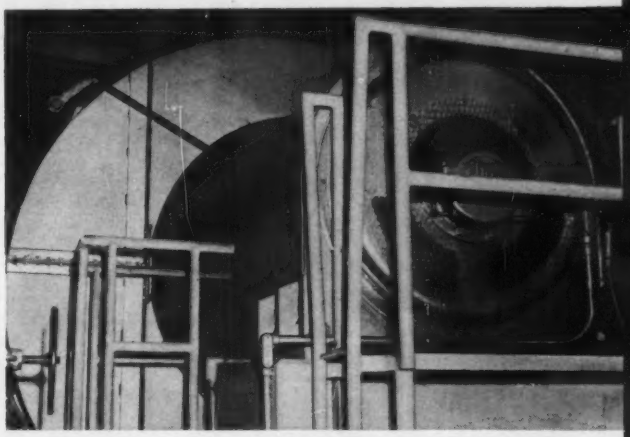
in 30° below to 100° above weather



It happened at Montana Power's outdoor station in Billings. Elliott weather-protected and dripproof motors in this "farthest north" outdoor station have not even been opened up and have required no maintenance whatsoever since installation in late 1951. This record was achieved even though these motors were on peaking service, with enhanced possibility of corrosion damage to bearings, or from moisture collecting on the windings.

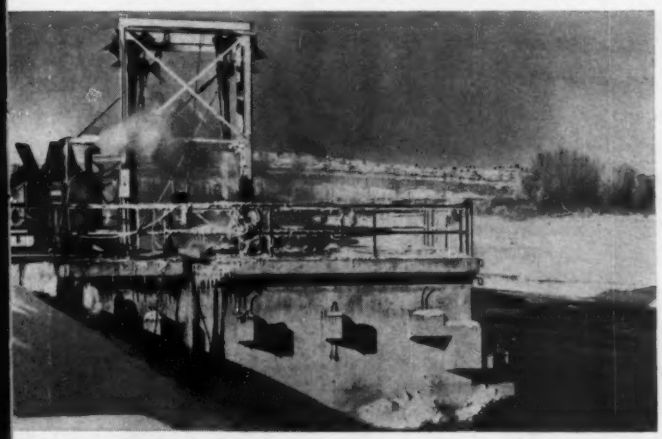


Exposed to rigorous hot-and-cold Montana weather and large amounts of snow, this Elliott 1000-hp, weather-protected type 2 motor is perpetually ready for action to power an induced-draft.

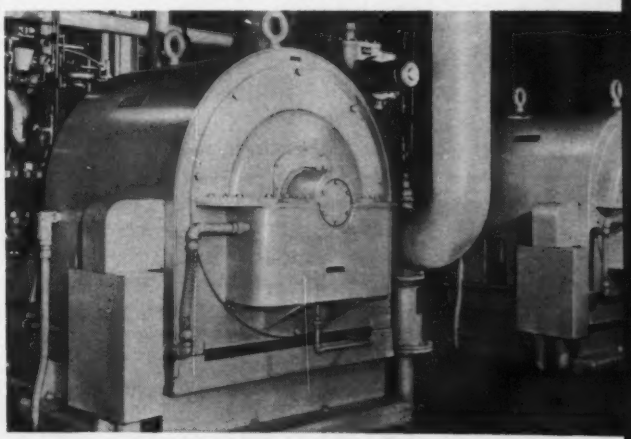


One of two Elliott 700-hp, 900-rpm, dripproof motors inside a semi-outdoor structure provide dependable power for forced-draft fans in peaking service.

On the banks of the Yellowstone River, the 500-hp, 12-pole Elliott vertical hollow-shaft, weather-protected type 2 motor shown below drives a circulating-water pump.

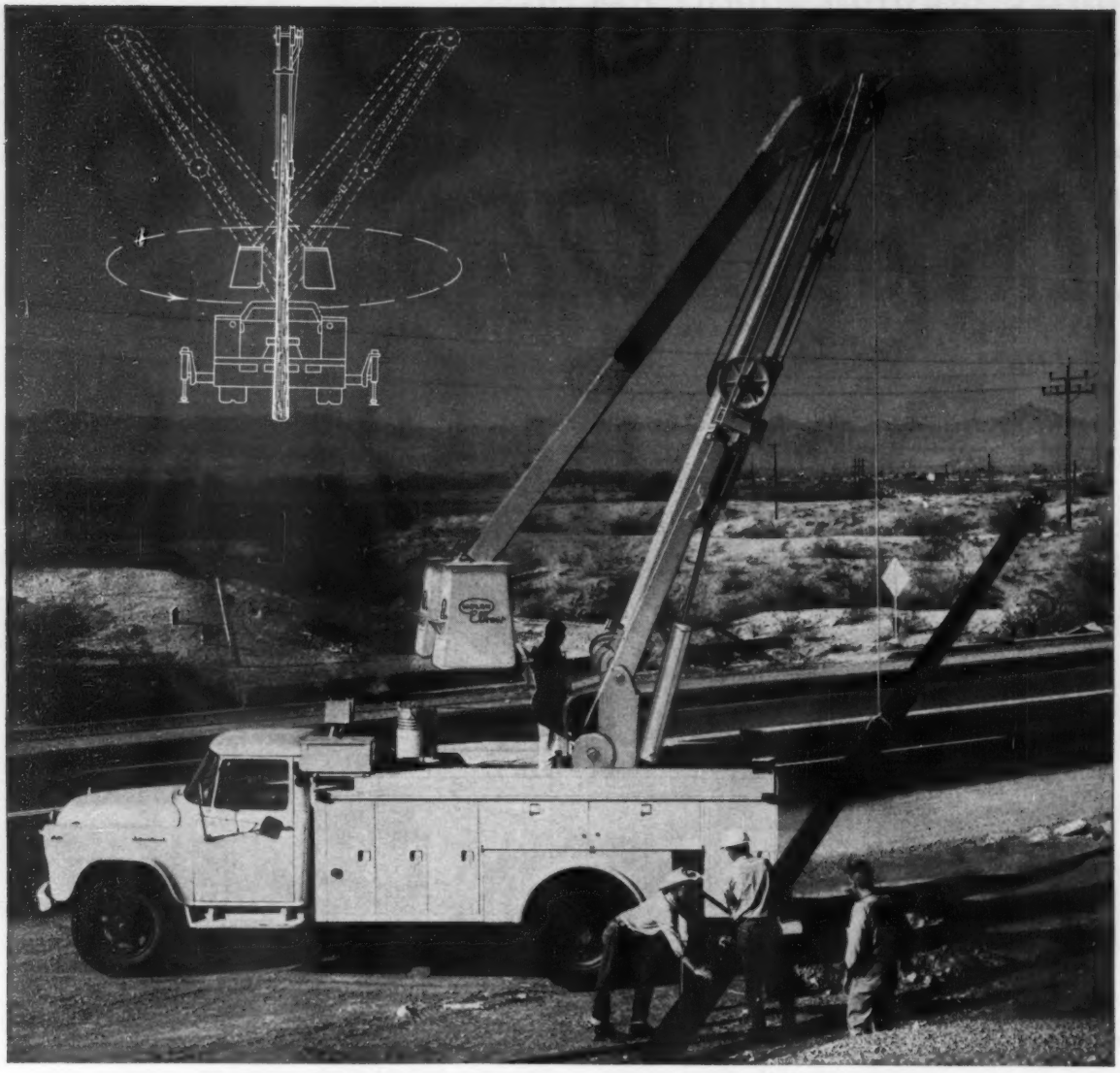


These two 1250-hp, 2-pole squirrel-cage induction motors have chalked up an enviable performance record of trouble-free service driving boiler-feed pumps.



RO

ELLIOTT Company Ridgway, Penna.



Holan heavy duty Elbow does double duty as derrick

Lifting workmen high into the air—or out—or down is only one of the uses of the Holan Elbow.

Equipped with an optional winch, the Elbow becomes one of the most versatile derricks in the field. It can be used for setting poles or lifting heavy loads and can be operated from either side of the body or the rear.

Because of 360° continuous rotation of the mast, the Holan Elbow used as a derrick can be located in any number of positions without moving the truck. This saves time — and money — in construction and maintenance work requiring derrick operation.

The winch can be installed on any of the three Holan Elbows: HD-42, HD-50 or HD-55. It will lift 4,000 pounds and set poles up to 65 feet in length.

Mounted on the mast, the winch is hydraulically driven from the Elbow hydraulic system with power from the power take-off or from a separate gasoline engine.

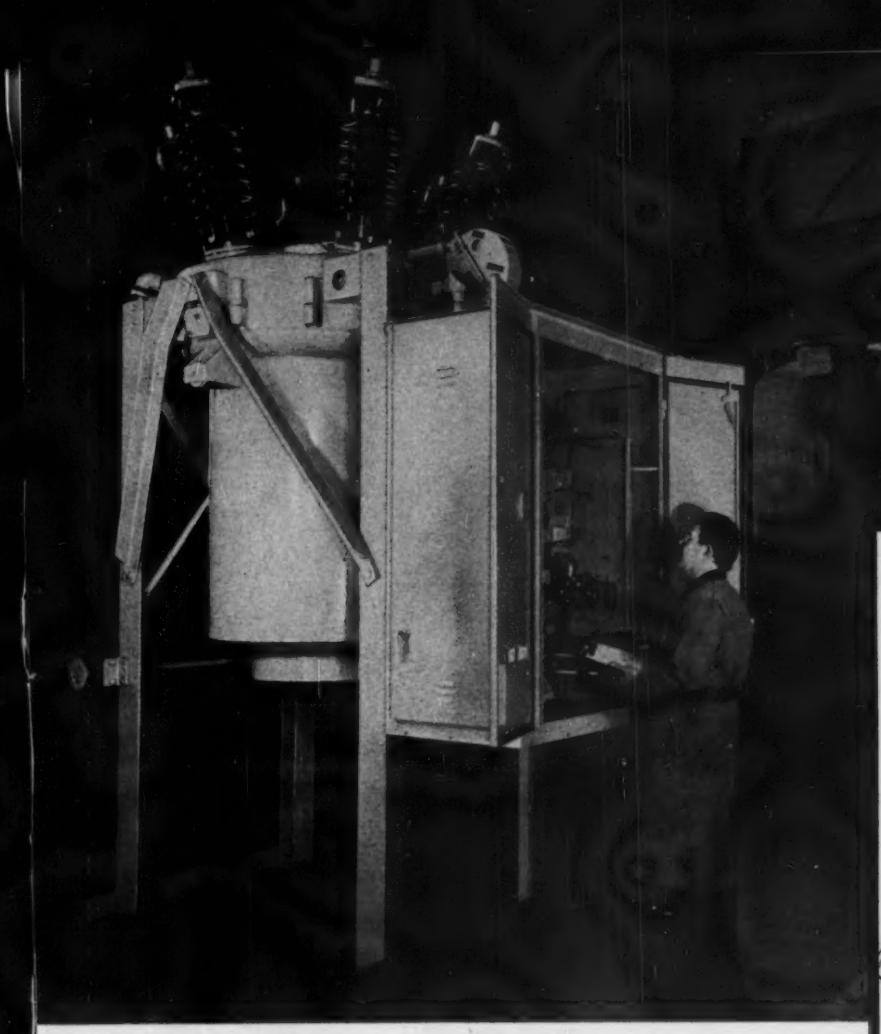
In the Holan Elbow you have an aerial elbow that reaches up as high as 55 feet and a serviceable, versatile derrick —*all in one.* Write us for complete details—or get in touch with your Holan Field Representative.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN



- Only One Tank to Lower
- Easy Access to all Internal Parts
- From 30 to 80 Gallons Less Oil
- Saves 20% Maintenance Time

NEW I-T-E TREND-LINE BREAKERS SET THE PACE FOR SUBSTATION ECONOMIES

I-T-E, the foremost U.S. manufacturer of switchgear and power interruption equipment, announces an exciting new line of outdoor power circuit breakers—the I-T-E TREND-LINE. Now, substations may employ single-tank breakers in subtransmission ratings with complete confidence in the reliability and performance.

Incorporating a new KOOL-ARC vertical interrupter, these breakers deliver 5-cycle interrupting time as standard performance. Although all phases are contained within a single steel tank, adequate clearance and special tank liners and phase barriers ensure equal or better protection than that afforded by three-tank designs. The new single tank can be easily dropped by one man using an electric tank lifter. With only one tank to service and maintain, substation economies are realized that were previously impossible with the old three-tank designs.

For descriptive literature on the I-T-E TREND-LINE, write to 1667 North Main Street, Los Angeles 12, Calif., Dept. EWO-960-3.

I-T-E CIRCUIT BREAKER COMPANY
KELMAN POWER CIRCUIT BREAKER DIVISION

ANACONDA®
designs
and
makes both
ACCESSORIES
and EHV cable

The same engineering teams research, develop and use-test both EHV accessories and cable at Anaconda. The advantage is clear: no weak links in the system.

This coordinated effort has another customer benefit—special accessory problems can be considered when the system is designed. For example:

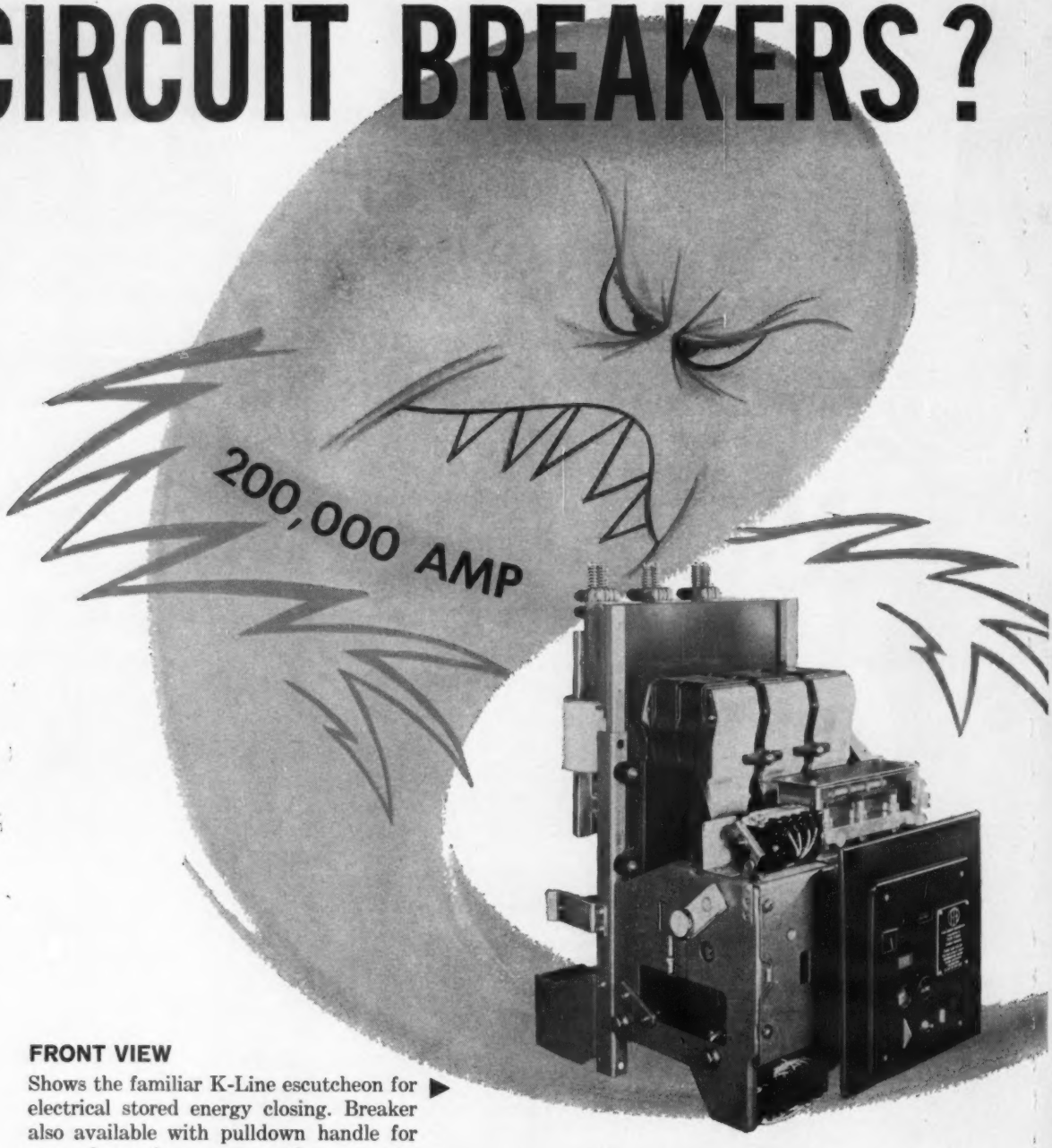
One customer needed a semi-stop joint that would not only locate faults and isolate any pressure loss in HPOF pipe-type cable, but would also let the cable move longitudinally without disrupting the seal or crushing the insulation. Anaconda met both requirements with a flexible barrier design that also matched cable characteristics perfectly.

In another typical case, a customer desired a pre-assembled termination unit that would provide controlled bending and fast sealing of pipe-type cable during the difficult pull to the first manhole. Furthermore, the customer's operating requirements would allow no welding either during or after the pull. Anaconda answered the problem with a "drop-casing" terminal assembly that proved to be a unique solution.

These examples won't necessarily parallel your own requirements, but they do demonstrate Anaconda's capacity to develop specialized accessories that meet the requirements of the customer and the cable equally well. To find out specifically how Anaconda's Integrated Approach can solve your EHV accessory problem, contact Anaconda Wire and Cable Co., 25 Broadway, New York 4, New York. 60227

See the man from
ANACONDA®
for accessories

HOW MANY AMPERES LURK BEHIND YOUR LOW VOLTAGE CIRCUIT BREAKERS?



FRONT VIEW

Shows the familiar K-Line escutcheon for ▶ electrical stored energy closing. Breaker also available with pulldown handle for manual stored energy operation.

I-T-E's new K-Don protects against fault currents up to 200,000 amp—plus giving you the complete range of K-Line circuit breaker operation

Suppose you have a low current fault. The K-Don circuit breaker element gives you time delay tripping. Or a medium current fault. You get instantaneous tripping. And for really high-capacity faults, you have the current-limiting action of Amp-trap® fuses in series with the breaker.

MAXIMUM FUSE ECONOMY

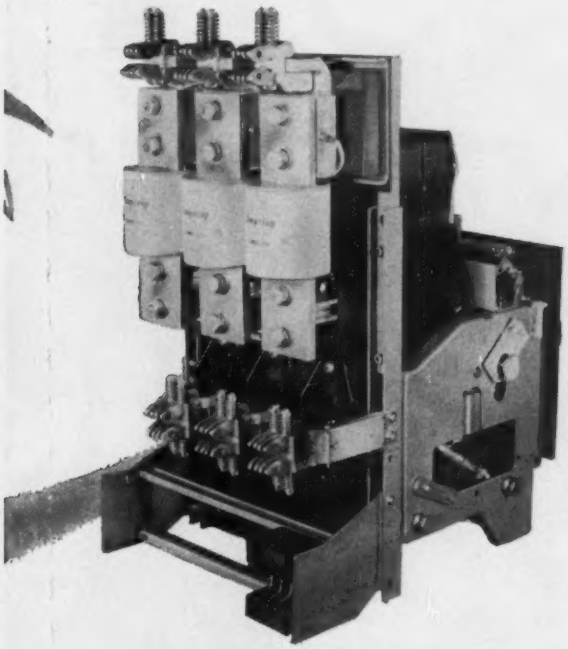
Only the I-T-E K-Don gives such complete protection—circuit breaker protection over the standard circuit breaker range and economical fuse protection from there on up to 200,000 amp. The only time fuses blow is when fault current is too high for the circuit breaker to handle. The K-Don is not a fuse hog.

NO SINGLE PHASING

The K-Don gives you this double protection all in a single compartment—saving you cost and bulk. And regardless of the type of fault, all three phases open every time. No single phasing to cause costly equipment damage.

COMPLETE RANGE OF RATINGS

Basically, the K-Don is a standard 600 volt K-Line circuit breaker with current-limiting fuses in series. Besides high current protection, you also get the advantages of expanded range trip and closed door drawout. Breaker ratings range from 30 to 1600 amp continuous, up to 75,000 amp interrupting. Versatility of protection is assured by a range of fuse ratings from 400 to 3000 amp. Drawout mountings are available in either Urelite® enclosures or switchgear assemblies. Write for detailed bulletin 4300-1A. I-T-E Circuit Breaker Company, 1900 Hamilton St., Philadelphia 30, Pa.



BACK VIEW

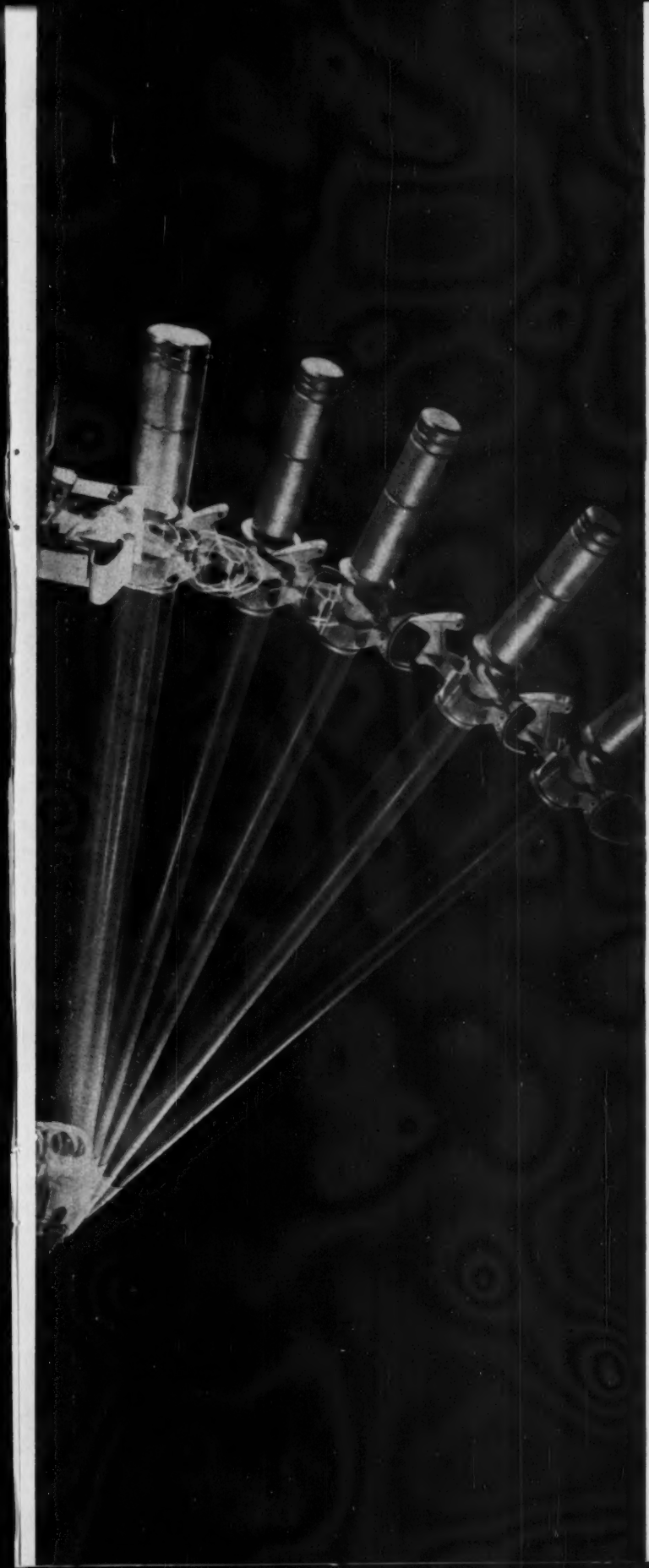
◀ Shows Amp-trap current-limiting fuses in series with circuit breaker. Fuses are on line side so they protect the breaker as well as connected equipment.

I-T-E CIRCUIT BREAKER COMPANY

NOW 2,000,000 kva

CO_2 gas bomb—insures arc extinction on lowest faults
Fixed boric acid cakes—cemented to inner fibre liner—provide large bore for high faults
Expellable boric acid cakes provide minimum diameter bore for effective interruption of medium-to-low faults
Frangible retaining disc supports expellable boric acid cakes. The blast action of high faults ruptures the disc and expels the inner cakes. The resultant larger bore reduces internal pressures and exhaust gas velocities
Fusible element—nondamageable construction

SMD—2B FUSE UNIT



100% higher interrupting ratings for S&C Power Fuses... and confirmed by test

This new performance level means you can now use power fuses on power transformers tapped onto transmission and subtransmission lines—even where faults may run as high as 2,000,000 kva. Now you can have power fuse protection of small-to-medium transformers in even more places on your system. You have more opportunities to get the benefits of S&C Power Fuses: low-cost, maintenance-free protection against primary and secondary faults, without momentary interruptions on the line.

All this is made possible by S&C's new SMD-2B Power Fuse, which uses a new principle in boric acid circuit interruption, explained on the opposite page.

Behind these new ratings* is a three-year program of laboratory and field testing, culminating in the heaviest faults ever deliberately applied to a power fuse. At the KEMA laboratories at Arnhem, the Netherlands, a power fuse (S&C's SMD-2B) for the first time successfully and repeatedly cleared line-to-line faults of 2,000,000 kva magnitude.

For complete information, write for Descriptive Bulletin 261.

*New ratings established by test

Voltage Rating	Interrupting Rating, Kva 3-Phase Symmetrical	
Kv	New	Old
34.5	1,500,000	1,250,000
46	1,750,000	1,250,000
69	2,000,000	1,500,000
115	2,000,000	1,000,000
138	2,000,000	1,000,000

S & C ELECTRIC COMPANY

4421 Ravenswood Avenue • Chicago 40, Illinois

Specialists in High Voltage Circuit Interruption since 1911

S&C

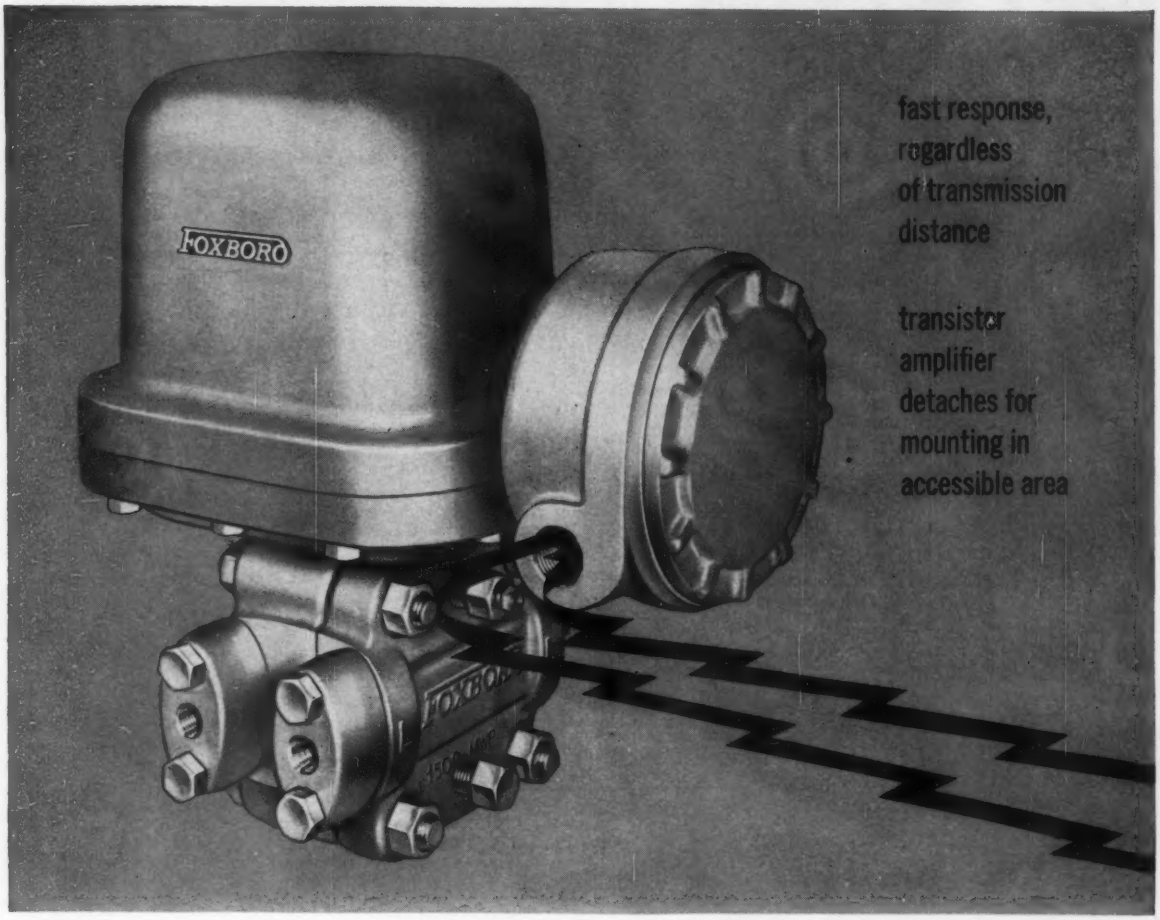
DODGE

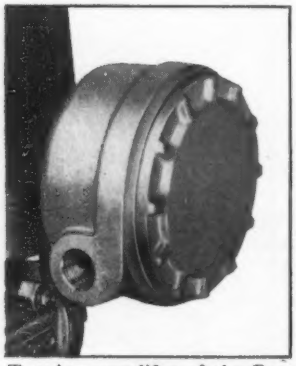
Compact diet. Compact upkeep costs. Compact in everything but work capacity. A full half-ton hauler that'll do the dirty jobs every day, day in and year out. New right down to the wheel studs. New cab. New body. New and easier clutching, shifting, handling. Even a new soft sound. New Dart Power Six, overhead valve, 225-cubic-inch engine that will actually deliver more miles per gallon than Ford and Chevrolet. That's how our tests worked out. And we wouldn't talk about it if you couldn't get the same results. The engine is slanted 30 degrees from the vertical for top-notch manifolding, both intake and exhaust. **THE '61 DODGE LINE?** All Dodge, all tough from end to end. Conventional and cab forward models, four-wheel drive series, Town Wagons for toting men and tools. Six and V8 gasoline power. Cummins diesels. A weight spread of 4300 lbs. GVW to 76,800 lbs. GCW. **PRICE?** The new Dart Pickup and the whole 1961 Dodge line of trucks are priced to compete with every truck coming or going. What more do you want? See your Dodge dealer now!

DODGE TRADESMAN Puts your tools and supplies right where you want them. Vertical and horizontal compartments, with locks, on both sides. Big floor area for your bulky stuff. Offered with all-new Dart Power Six or V-8 power, 2- or 4-wheel drive.

A PRODUCT OF CHRYSLER CORPORATION

introducing the Foxboro electronic d/p cell* transmitter


FOXBORO
fast response, regardless of transmission distance
transistor amplifier detaches for mounting in accessible area



Transistor amplifier of the Foxboro Electronic d/p Cell can be detached for relocation in an accessible area, so that all transistors are removed from possible contamination. Separate mounting has absolutely no effect on accurate measurement and transmission.

Yes, Foxboro has taken its famous pneumatic d/p cell transmitter and added to it the benefits of electronic transmission. Look at the results:

- true force-balance design for lowest displacement — fastest response
- solid state throughout — no vacuum tubes to replace
- pressure, flow, and level transmission up to several miles without lag
- same body, same performance as thousands of pneumatic d/p cells now in operation
- ranges from 5 to 850" of water — maximum working pressures to 6000 psi

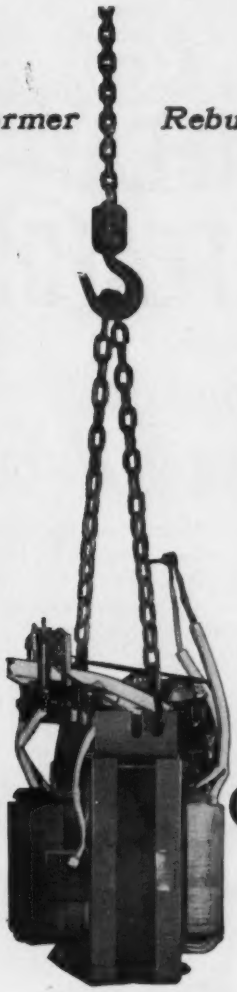
And then, of course, you get the same positive overrange protection, the same high sustained accuracy, the same rugged construction that has always been standard with the Foxboro d/p cell transmitter.

Foxboro electronic d/p Cells are presently in use measuring and transmitting: pressurizer level, primary coolant flow, and steam generator 3-element feed-water level and flow. For full details on this important unit in the Foxboro Electronic Consotrol* family, get in touch with your Foxboro Field Engineer. Or write for Bulletin 21-10. The Foxboro Company, 2410 Norfolk Street, Foxboro, Mass.

Reg. U. S. Pat. Off.

FOXBORO
REG. U. S. PAT. OFF.

In Transformer Rebuilding . . .



Specify Wagner Form W Replacement Assemblies for full NEMA Standard Cores and Coils with new low impedance and lower core losses.

Rebuild your own transformers? Send your rebuilds out? Regardless . . . it pays to specify Wagner Form W Replacement Core and Coil Assemblies. Do it, and get full NEMA Standard elements, exactly like those used in new Wagner Transformers.

You get the advantages of lower impedance values, better regulation and lower losses. You get the most out of up-rating,

It's the CORE & COILS *that count*

too. In sizes through 15 kva, you can install the largest cores and coils that will fit your tank, and still remain within NEMA temperature rise standards.

Wagner Replacement Assemblies, in ratings from 5 through 167 kva, come to you ready to install. They have been fully tested, vacuum-treated and dried, and are packaged in transformer oil for complete protection. Universal mounting brackets are included with each unit, 25 kva and smaller.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

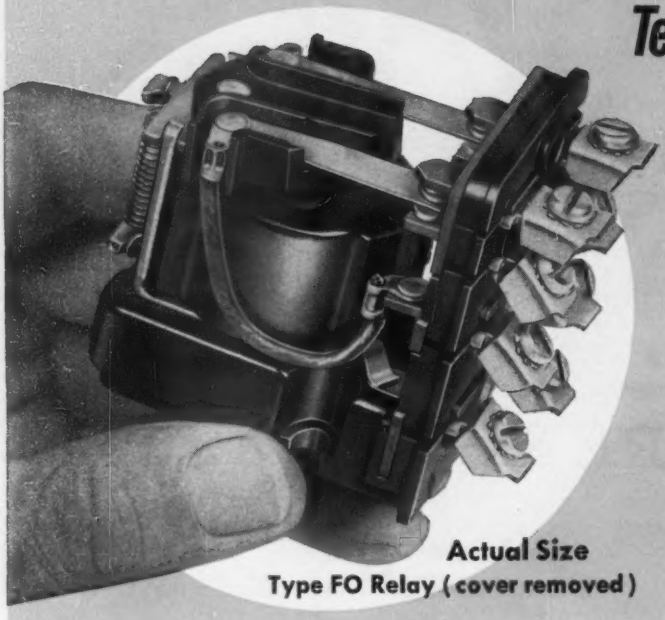
Wagner Electric Corporation
6456 PLYMOUTH AVE., ST. LOUIS 33, MO.

WR60-6

SERVING 2 GREAT GROWTH INDUSTRIES — *ELECTRICAL • AUTOMOTIVE*

NEW from Square D...

A SMALLER 10 AMP RELAY— WITH INDUSTRIAL FEATURES!

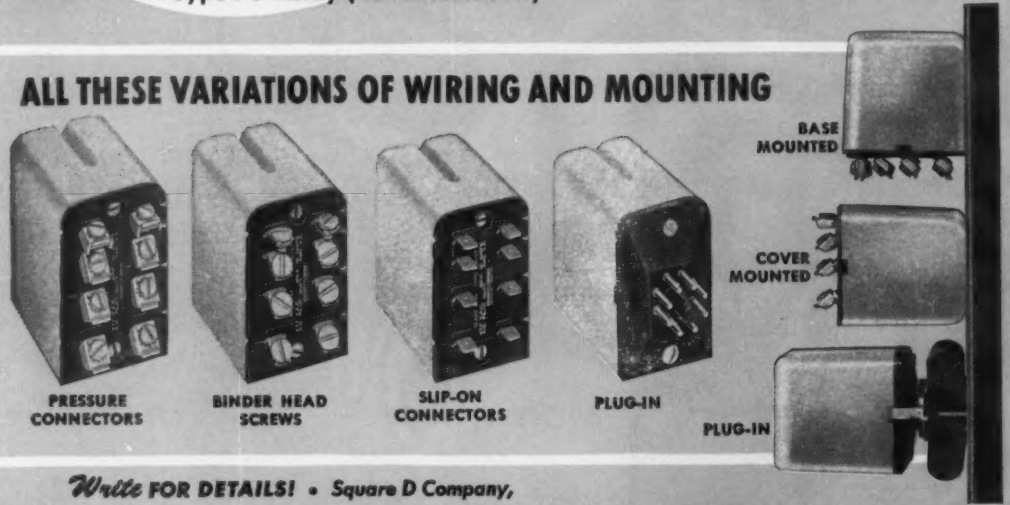


Actual Size
Type FO Relay (cover removed)

Terminal or Plug-In Wiring

- **RATINGS** easily handle solenoid loads. AC pilot duty rated 690 VA. Continuous rating 10 amperes, 125 volts AC for plug-in construction and 277 volts AC for terminal connection
- **Long Life** makes suitable for rugged machine tool applications
- **Molded coil** operates cooler and keeps out moisture for longer life
- **No solder joints** to break
- **Optional pilot light** indicates when relay is energized
- **Durable nylon dust cover** won't break, crack or support combustion

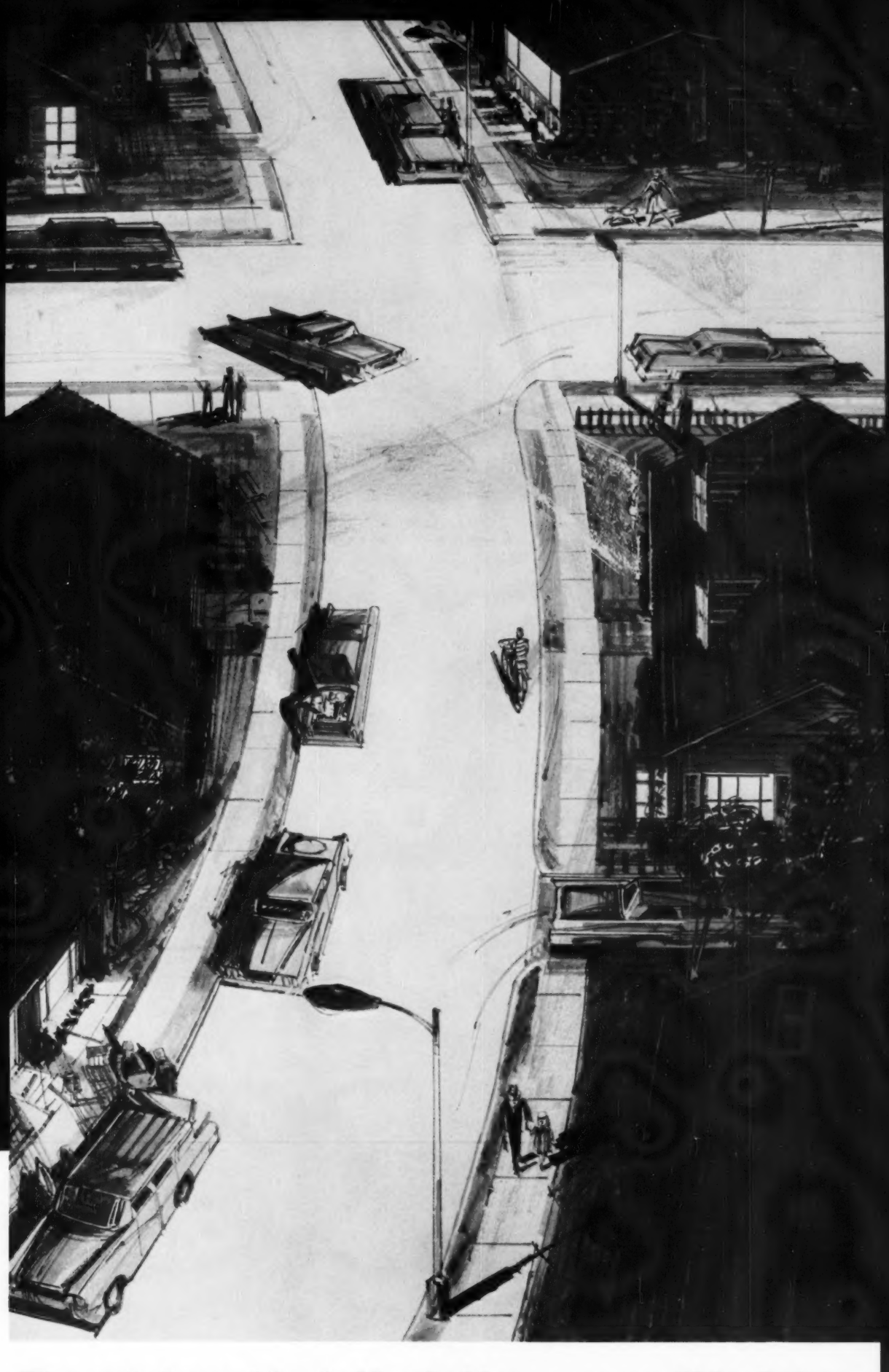
ALL THESE VARIATIONS OF WIRING AND MOUNTING



Write FOR DETAILS! • *Square D Company,*
Dept. SA, 4041 North Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

wherever electricity is distributed and controlled



Residential lighting profitable with economical new mercury unit

Exclusive design aims light to streets, sidewalks . . . away from bedroom windows

At last! A luminaire that is specifically designed for "profit-making" residential application. Now, with the new General Electric M-250R mercury luminaire, you can do the job you've always wanted to do . . . to serve your communities with modern, efficient residential lighting—*and at a fair and reasonable profit!*

Smartly styled, economical G-E M-250R luminaires now make code-level residential lighting a practical, profitable venture for every utility. Here's how:

Unmatched efficiency—The new G-E M-250R luminaire, with "bonus-line" mercury lamp, delivers nearly three times as many lumens of useful light six times as long as does a filament fixture and lamp of equal wattage rating. For example, a 175-watt M-250R luminaire produces 7000 lumens; a filament fixture of comparable wattage, only 2500 lumens.

What's more, you get unparalleled photometric performance from General Electric's exclusive new turning-prism refractor which bends light a full 70 degrees—more than any other refractor made. Now, light is turned away from bedroom windows and directed on the street where it belongs!

Unmatched operating economy—Following IES lighting recommendations, you could code-level light your residential streets by placing a filament fixture every 120 feet. But, you can light the same streets—to higher than code-level minimums—with General Electric M-250R mercury luminaires spaced every 240 feet . . . *exactly half as many luminaires, poles, and brackets!* You get up to 60 percent more light per operating dollar, more useful light, and at bargain over-all costs!

Unmatched appearance—Functional, modern styling of the new General Electric M-250R luminaire complements the appearance of any modern neighborhood in which it's seen . . . whether at night or by day.

Increased nighttime safety—with fewer crimes and lower traffic-accident rates—is still another advantage of modern, mercury lighting for the residents of your community.

SPECIAL INTRODUCTORY OFFER

General Electric is making a three-unit "Light-a-Block and SEE" package offer to you for a limited time. You can set up permanent demonstrations on a block in each community you serve. Let everyone see the beauty of residential neighborhoods spring to life under modern lighting. Show municipal officials the lighting they will want to have . . . and that you will be glad to furnish. Let every official of your company see for himself—under controlled conditions—the many profitable, practical benefits of the M-250R luminaire.

Start your "Light-a-Block and SEE" projects right away! Your General Electric Sales Engineer will be happy to give you the details. And, for the new M-250R descriptive bulletin, write General Electric Co., Section 460-10B, Schenectady, New York. *Outdoor Lighting Dept., Hendersonville, N. C.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW GENERAL ELECTRIC M-250R LUMINAIRE

NEW from General Electric...

an oil cutout for 15-kv service

A new oil cutout, rated 15-kv, 200 ampere, 95-kv BIL, 7,000 amp I/C, is added to the line of 5.2- and 7.8-kv oil cutouts. This means you can now get a General Electric oil cutout to meet most utility or industrial application needs.

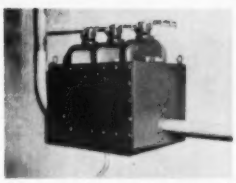
This versatile line of oil cutouts can be dependably used for centralized or single feeder-load break and overcurrent protection in building-vaults, substations, hazardous atmospheres; or where complete submersion is possible. Mount them on poles, or as an integral part of apparatus. However used, General Electric cutouts give you positive load-break and high-current interrupting ability at the lowest cost available.

General Electric oil cutouts are available for either sealed or vented applications. Single units may be individually or gang operated in a rack or metal-enclosed assembly. Cable terminations to meet various requirements can be furnished.

Ask your local General Electric Sales Engineer for more information or write Section 488-04, General Electric Company, Schenectady. New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



Wall-mounted, metal-enclosed assembly, rated 15 kv, 200 amps.

Stand-mounted metal-enclosed assembly with two—three phase circuits, 15 kv, 200 amps.

INTRODUCING...

the efficient,

new mercury

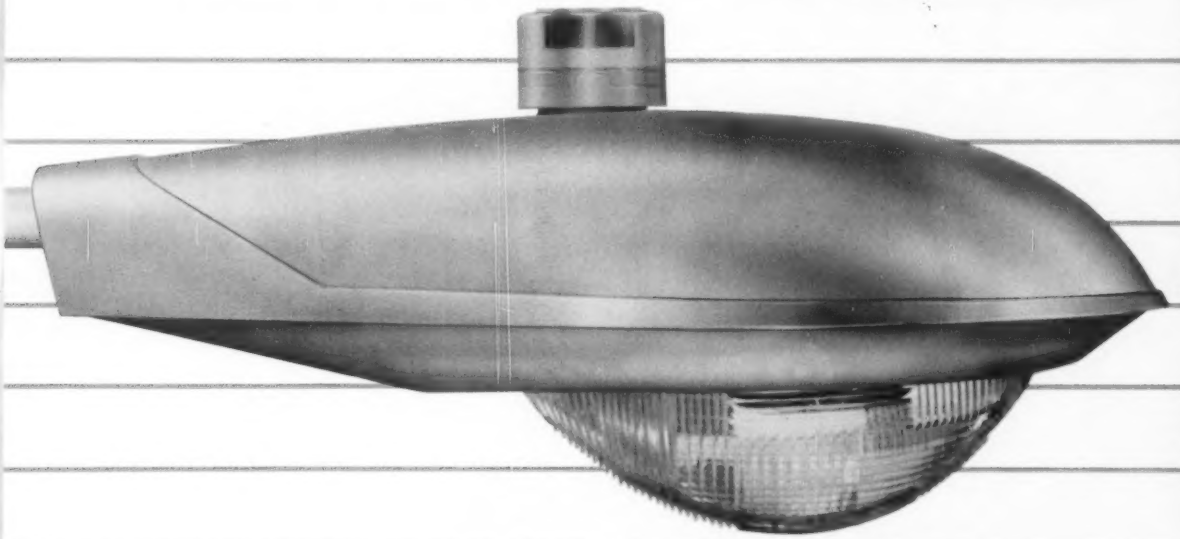
luminaire that

makes code-level

residential lighting

practical for

every community



NEW GENERAL ELECTRIC M-250R LUMINAIRE

AEG

The development and supply of electrical equipment for industry has been a vital part of the AEG manufacturing programme ever since this firm was established 75 years ago.

The present AEG manufacture ranges from the industrial turbine to the electronically controlled drive. A "tailor-made" electrical equipment to suit any particular application is the basic requirement for a modern and efficient industrial plant in this age of automation.

AEG
means
ELECTRICITY

8241e

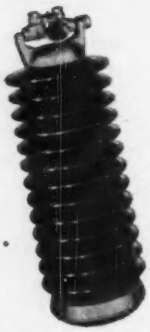
ALLGEMEINE ELEKTRICITÄTS-GESELLSCHAFT

Berlin (West) EXPORT DEPARTMENT Frankfurt (Main)

CLAMP

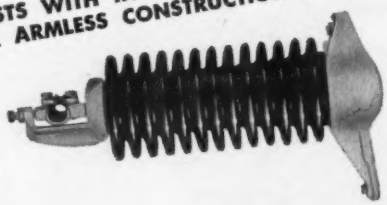
THE LAPP CLAMP IS INTERCHANGEABLE

Five sizes of clamps, in aluminum or malleable, each with reversible keeper, provide correct fit for all conductor sizes .25″ to 2.00″ dia. All clamps are interchangeable for use on

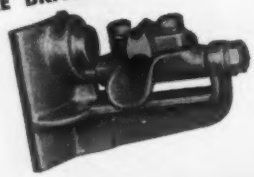


CLAMP-TOP LINE POSTS . . .

CLAMP-TOP LINE POSTS WITH INTEGRAL BASE-AND-GAIN FOR ARMLESS CONSTRUCTION . . .



CLAMP-TOP GROUND-WIRE BRACKETS



-TOPS?

THE LAPP CLAMP IS EASIEST TO INSTALL

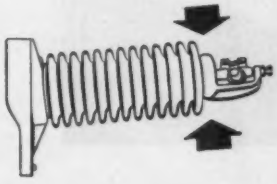
For original installation, insulator (or bracket) with clamp attached, is mounted to crossarm or pole. Keeper cap screws are loosened, and one removed. With keeper rotated out of position on remaining cap screw, conductor is dropped into place. Keeper is brought back to position, cap screw replaced, and both cap screws tightened. Cap screws have captive lock-washers so there is *only one loose part* per insulator throughout installation.

THE LAPP CLAMP IS EASIEST TO WORK WITH HOT-LINE TOOLS

No special tools required for insulator change-out. A trunnion cap screw is merely backed off, and conductor (with clamp attached) lifted out of position. The same clamp will slip into position in a replaced insulator and be secured by tightening trunnion cap screw. *No loose parts* throughout insulator change.

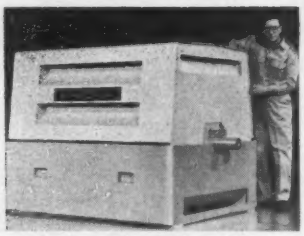
THE LAPP CLAMP-TOP IS MOST DEPENDABLE

A principle of Lapp Post design is the *external* attachment of hardware—*bases and caps*. This assures that the porcelain body be loaded only in large-area low-intensity compression. This design takes full advantage of porcelain's superior compression strength, and provides an assembly greatly more secure than one subject to the high-intensity tension loading introduced by internal pins and inserts.



Lapp

For new ideas on economical, efficient line and station construction read the new Lapp Catalog Eight. For your copy, write Lapp Insulator Co., Inc., Le Roy, N. Y.

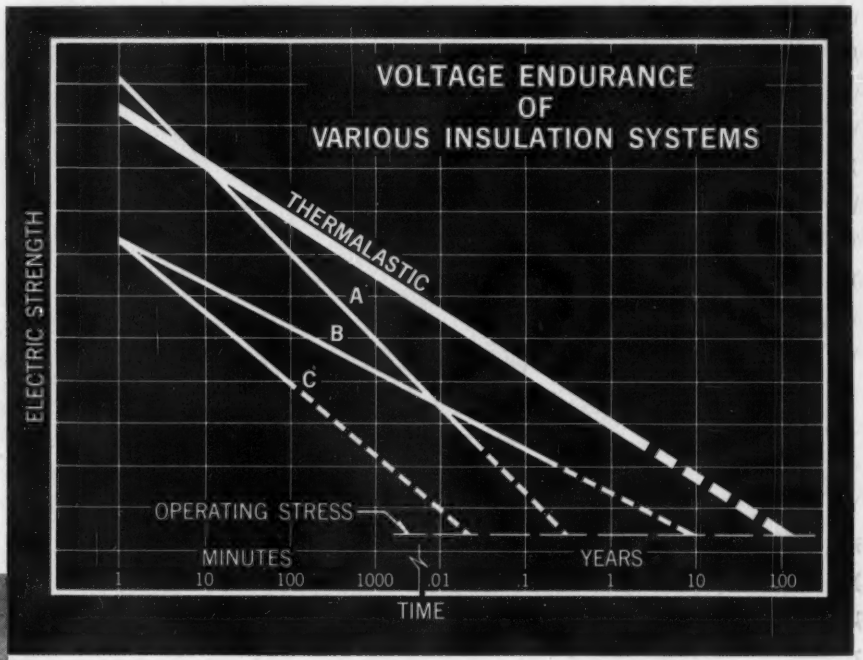


MORE VALUE FOR YOUR LARGE MOTOR INVESTMENT . . .

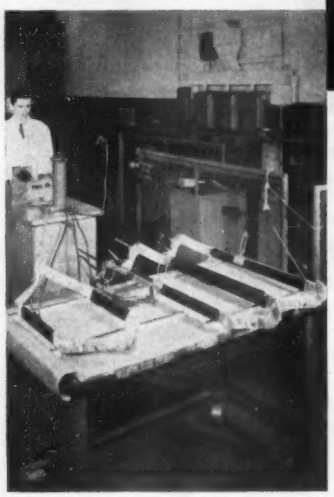
Westinghouse F/A Motor insulation

Thermalastic®, the "insulation with a memory," has been protecting the coils in more than 50,000,000 kw of Westinghouse large rotating apparatus since its development in 1949. In that time the three or four coil failures experienced have resulted from mechanical causes . . . not one failure of Thermalastic insulation itself has occurred.

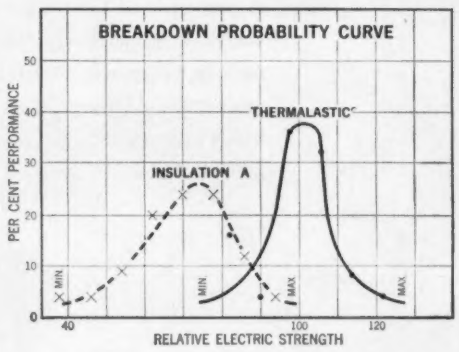
Helping to assure this outstanding performance are rigid laboratory tests which show Thermalastic insulation to be 20 times longer lived than other insulations. Tests on 4160-volt



Voltage endurance: This chart shows the results, plotted and extrapolated on a semi-logarithmic scale, of voltage endurance tests performed on several types of insulation. The combination of properties shown here by Thermalastic is unequaled—high initial dielectric strength and excellent voltage endurance.



In this destructive electric strength test, several insulated coils are picked at random. The various voltages at which failures occur are noted and plotted to form a breakdown probability curve (right). Thermalastic shows more consistent performance and at higher levels.



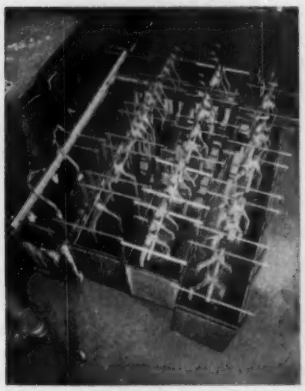
YOU CAN BE SURE...IF IT'S

tests show probable 100-year life!

windings with Thermalastic insulation indicated a probable life expectancy of at least 100 years!

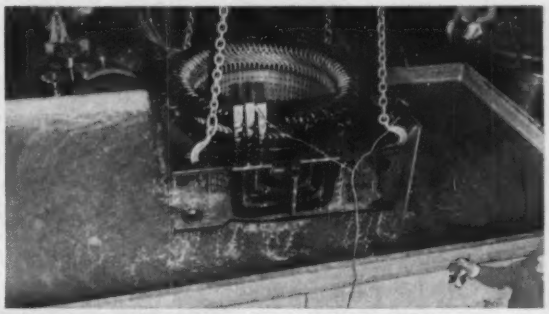
The key to this surprisingly long effective life is Thermalastic's unique molecular structure. Large overlapping mica splittings are locked in a void-free elastic bond which expands and contracts with the coil. Thus, a perfect dielectric barrier is maintained under all operating conditions, easily warding off the attacks which weaken and destroy ordinary insulation. Thermalastic is used on all F/A Motors and is another reason why the Westinghouse F/A gives you more value for your large motor investment.

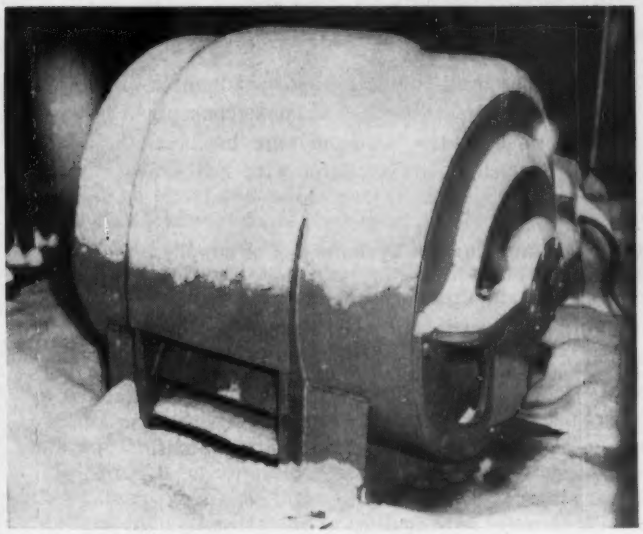
J-15017



Moisture resistances of various types of insulation are measured in this submersion test. Of all systems tested, Thermalastic has proven to be the most reliable system under long exposure to moisture.

Complete windings: Tests on coils do not always indicate the resistance to moisture of a complete winding. The test pictured here involves immersion of a completely wound stator. Measurement of insulation resistance showed no deterioration of any kind in Thermalastic-insulated stators.





Service tests: This conventional indoor 600-hp motor with Thermalastic insulation has been running outdoors for more than three years. Built before the F/A Motor was introduced, it has been subjected to these rigorous conditions:

- Twenty-four hours a day, five days a week, with weekend shutdowns to approach normal operating conditions.
- Summer and winter weather, with all moisture and temperature extremes.

It is still running smoothly and shows no sign of insulation breakdown or other deterioration.

COMPARE! how much costly down time has insulation failure caused in your plant?

USE THIS SIMPLE CHART TO MAKE YOUR OWN COMPARISON

	THERMALASTIC	YOUR INSULATION
Number of years	11	
Cost of repairs	0	
Hours of down time	0	

There is a Westinghouse F/A Motor to fill all your large motor needs. Call your Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

Westinghouse

from **RCA...**

3 NEW Electronic Systems that Advance Industrial Automation

RCA Industrial Electronic Control is industrial dynamism of a higher order—a new electronic control of production operations resulting in a smoother flow through the plant, a bigger yield, and a degree of efficiency never before attainable.

Systems capabilities range from simple automatic monitoring to complete real-time control of a complex automated operation spread over a wide area. There are *now* three RCA Industrial Electronic Control Systems available:

The RCA-110 Industrial Control Computer System—Specifically designed for industrial applications to provide around-the-clock operating reliability, highest arithmetical speed and lowest cost installation. Solid state design, core and random access drum memory. Computer built for industrial environment.

The RCA-130 Industrial Data Transmission Link—Removes the limitation of distance in an automatic monitoring or control system. Provides reliable on-line, real-time transmission of analog or digital information via wire or radio, one-way or two-way. 100% checked.

The RCA-150 Industrial Data Analysis and Recording System—Provides high-speed, automatic monitoring and analysis of process and production status—plus computational capability for summarizing, averaging, totalizing and linearizing.

These new RCA systems incorporate industrial thinking as advanced as the electronic design of the equipment itself. The new concepts may well be of paramount importance to the future of your business. RCA Industrial Electronic Control Systems are available with Foxboro and other instrumentation.

For special industrial control problems, **Custom Systems** can be supplied to fit your exact needs.

To tell you how this modern kind of industrial automation works and the many things it will do, would fill a book. You will want to get the full story in person. Ask your nearest Foxboro representative or write—Industrial Computer Systems Department, Electronic Data Processing Division, Radio Corporation of America, 21 Strathmore Road, Natick, Mass.

AUTOMATIC PROCESSING

RCA

The Most Trusted Name in Electronics

RADIO CORPORATION OF AMERICA

LINE MATERIAL FINDS "A BETTER WAY"

Close-up of Peltier thermoelectric device. Spring tension on the heat pumps automatically adjusts the device to different lamp bulb diameters. Can be used with any T12 through T17 lamp. L-M's Peltier device is presently available only for 6-foot, 4-lamp shallow luminaires.

This six-foot, four-lamp shallow luminaire utilizes four L-M Peltier thermoelectric heat pumps for spot-cooling the fluorescent lamps. In the heat pump, direct current flows through a series of junctions of dissimilar metals, alternately absorbing heat in one junction and liberating heat in the other. The cold junctions contact approximately one-half square inch on the lamp bulb walls thereby maintaining the mercury vapor pressure within the lamps at the optimum value for maximum light output.

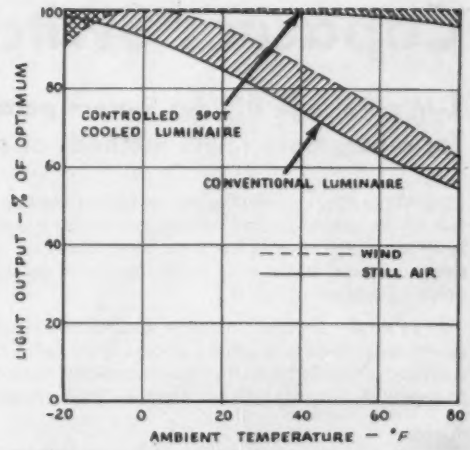
L-M's Revolutionary New Development Keeps Fluorescent Output at Maximum

by **STACY STANDLEY,**
Product Manager, Lighting
Line Material Industries

Now—Line Material develops another important engineering advance in outdoor lighting—Thermoelectrically Cooled Fluorescent Luminaires. These luminaires solve the basic problem of fluorescent lamp lumen output variation caused by ambient temperature changes. Another vital contribution by Line Material Industries to better outdoor lighting.

L-M Lighting Development Engineers have ingeniously adapted the Peltier thermoelectric principle to spot-cool fluorescent lamps. By the simple process of cooling a small area of each lamp, internal mercury pressure is held at the optimum and light output is maximized regardless of ambient temperature.

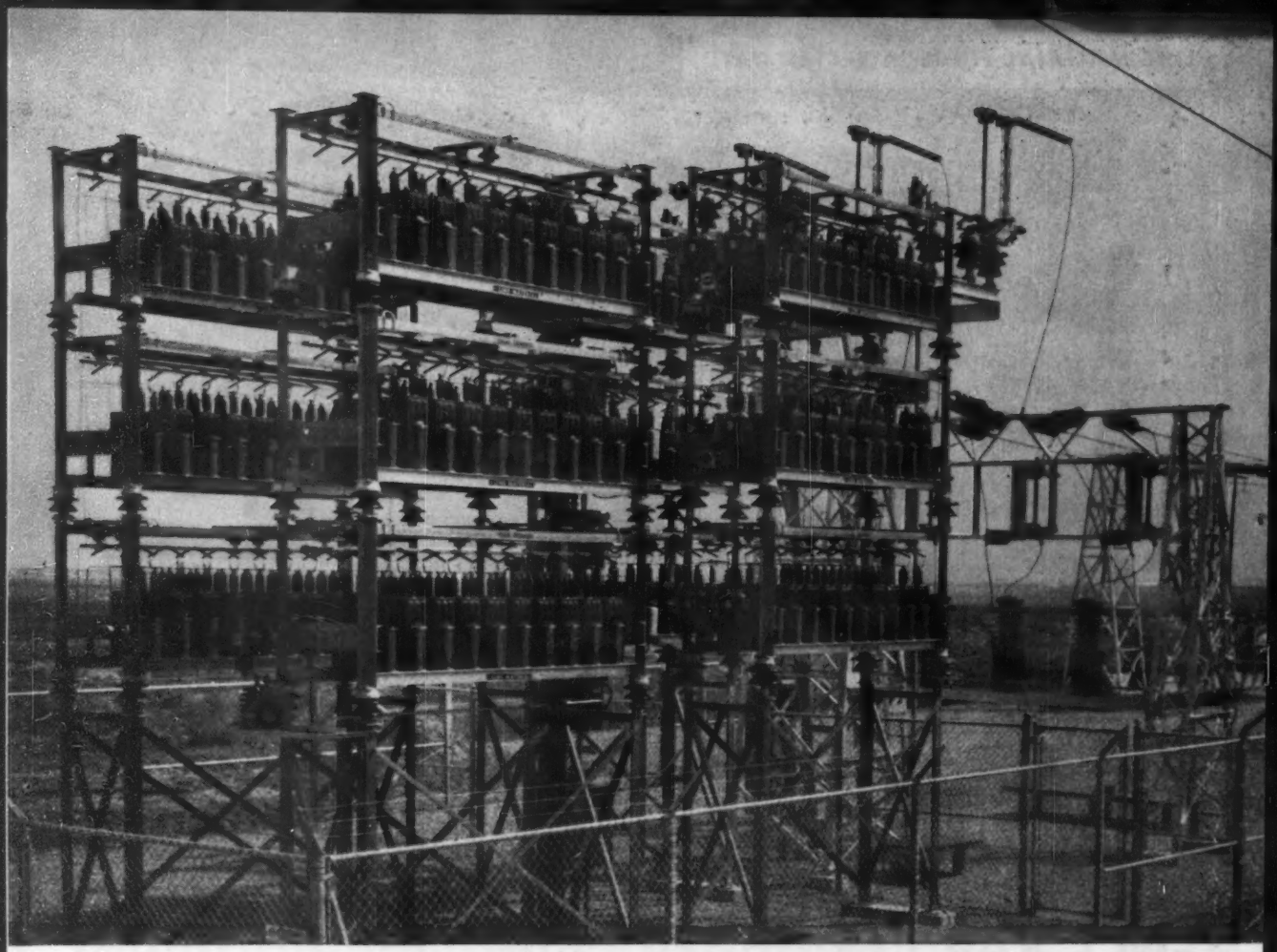
Be sure you get complete information on L-M's latest contribution. Contact your L-M Lighting Engineer, or write direct to Line Material Industries, Outdoor Lighting, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.



Performance curves of luminaires with and without controlled spot cooling: solid edge of band represents still-air conditions, dotted line represents 10 MPH of wind.

LINE MATERIAL® Industries Outdoor Lighting
McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT



46 kv, 21,600 kvar step-switched capacitor bank at Utah Power & Light Company's Terminal Substation, Salt Lake City. This bank is step-switched by the L-M Voltage Divider Switching scheme, which utilizes a number of low-cost, 15 kv remote control oil switches, on all but the first step. (Photo by R. J. Norton)

L-M VDS Bank Provides Economical Capacitor Switching for Utah P&L Co.

L-M's Voltage Divider System permits substituting low-cost L-M 15 kv oil switches for other, more costly methods of step-switching large capacitor banks.

Line Material's Voltage Divider Switching method uses L-M's NR 15 kv remote control oil switches on all but the first step. A large number of switches is required, but since they are relatively inexpensive, the total switching cost is far less than with other methods.

Utah Power & Light Company recognized a need for reactive supply when local generation was off and the Salt Lake City load was heavy. The Terminal Substation capacitor bank was installed to supply such power. Use of the L-M VDS system provided a low cost method of switching. The installation accomplished the purpose for which it was designed.

Ask for Technical Paper on VDS

Ask the L-M Field Engineer for information on the L-M VDS method—and for copy of a technical paper on the subject. He will also be glad to tell you about L-M's outstanding line of secondary, industrial, 25, 50 and 100 kvar capacitors; and about L-M's Capacitor Application Engineering Service. Or write Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

472

Elemex® Capacitors

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE & CONDUIT

Electrical World

OCTOBER 10, 1960

Editorial Comment

The Image Is as Important as the Facts

A successful politician must master the art of projecting strong, easily accepted images of campaign issues. Usually he uses the technique of making broad simplified statements on the issues. That these statements may cause widespread erroneous inferences to be drawn is secondary in importance to how favorably an image "comes through" and is retained by the voters.

In use of this technique, perhaps the Democratic presidential nominee is coming out ahead on the issue of the posture of the United States electric power industry vis-a-vis Russia. Sen John F. Kennedy's simplified statements give a deliberate image of a country stumbling behind the USSR in electric power expansion; of a remedy involving pell-mell development of hydroelectric potential; and of a *modus operandi* calling for federal government excursions into more broad projects.

Kennedy stumbled over a complete inaccuracy on Russian vs United States power growth estimates, and Nixon has subsequently corrected him.

But the GOP nominee doesn't seem to be rising effectively to the issue, either to combat it defensively, or to project his own preferred image of partnership development of hydro where hydro makes sense.

The Senator, during the debate, went on to say:

"On the question of the development of natural resources, I would pay as you go in the sense that they would be balanced and the power revenues would bring back sufficient money to finance the projects in the same way as the Tennessee Valley (Authority)."

This single sentence could give rise to three wrong impressions: (1) That TVA is primarily a resource development effort; (2) That TVA is on some sort of pay-as-you-go, fiscally sound basis; (3) That the federal government can in an orderly way supply funds for such a project as TVA once it has a utility responsibility. These impressions are tougher to refute. They require *facts:*

(1) Of the $2.27-billion original investment in all TVA plant, more than 40% has gone into steam electric generating facilities—hardly natural resource development in the usual sense.

(2) To date—27 years after TVA's start—the agency has paid only $250 million of the $1.45-billion government investment in TVA power facilities. A 1959 amendment to the TVA Act trimmed nearly $200 million off the TVA debt to the government. This single action reduced the TVA debt nearly as much as the agency was able to do in 27 years of repayments. This is not pay-as-you-go.

(3) A Democratic Congress last year voted to send TVA to the private bond market for its money—virtually admitting that the federal treasury is not the proper source for financing an electric power utility operation.

But the campaign is not being fought on facts. It *is* being fought, and *will* be won, by that candidate who can project the clearest, most acceptable image of a man who can provide leadership to solve a deep-seated problem under a party whose fundamental approach is more consistent with its solution.

What's the moral? It is too late to devise new image-projecting approaches to the power issue. And it is too late to deny that power is indeed an issue.

For the future, we who oppose government power should reflect that, although we must have the facts on our side, we also must achieve the art of image projection. If this means use of emotion appeal, we should accept the requirement.

Electrical Industry Cases Before

US Supreme Court has not yet indicated whether it will hear appeal by AEC and Justice Department on Enrico Fermi

Decisions vital to the electric power industry may result from the legal tangles involving utilities which confront the US Supreme Court as it gets down to business this week.

The justices, who will hear the 1960 term's first cases this week after a week of private conferences, have already agreed to review such important disputes as the one between the Federal Power Commission and Consolidated Edison Co of New York, Inc. This concerns the utility's plans to burn natural gas in its boilers. The court has yet to decide whether it will hear other important power cases, including the right of Power Reactor Development Co to continue construction of its atomic power plant in Lagoona Beach, Mich.

A decision against Con Ed could stymie plans by other utilities to buy natural gas for boiler use. The court's approach to this case could also set forth some new guidelines for the FPC.

This dispute centers around a contract between Con Ed and Trans-Continental Gas Pipe Line Corp under which Transco agreed to bring in gas for Con Ed to burn in its Waterside steam electric station in New York City.

The FPC denied Transco permission to transport gas for Con Ed's use. Commissioners were concerned that the transaction could open up a "vast, new, unregulated" market for gas to industrial customers, and worried that gas prices might be pushed up.

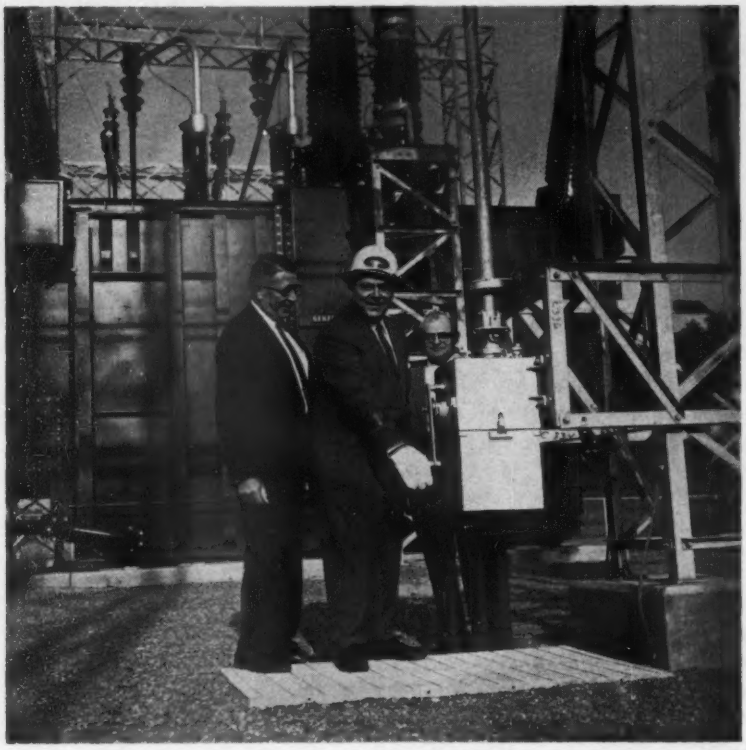
Transco and Con Ed deny that the contract would open up a new area of gas use. Transco maintains the Commission has no right to deny its application since the gas will not be re-sold at its destination.

An important question which the court may decide in this case: Does the FPC have the right to regulate the end use of natural gas?

AEC, Justice Appeal PRDC Case

Power Reactor Development Co, an association of 14 utilities, has been building its fast breeder reactor in Michigan under jurisdiction of the federal courts since 1956. Three labor unions complained this type of reactor was unsafe and asked to have construction stopped. An appeals court invalidated the Atomic Energy Commission's construction permit for the reactor, but agreed to let PRDC proceed with construction until the Supreme Court rules on the validity of the permit, or refuses review of the case. The court so far has not decided whether or not it will hear the case.

The principal ground of the appeals decision, handed down June 10, was that AEC could not locate the reactor at its present Lagoona Beach, Mich., site without finding "compelling reasons" to do so. The latest government brief, however, says the appeals judgment would "seriously impede, and in significant areas, might even block, the program and policies that the Atomic Energy Commission has carefully



460-Kv Experimental Line Energized

The first 460-kv line to go into network operation in the United States has been placed in experimental service by Pennsylvania Electric Co. The 13-mile transmission line reportedly matches the voltage of any line now in operation.

A. F. Tegen, president of General Public Utilities Co, is shown closing the 460-kv air break switch, preparatory to placing the line in operation. With Tegen are E. W. Morehouse, General Public Utilities, and Paul L. Lumnitzer, Pennsylvania Electric Co, in background.

High Court

developed in this important area of national scientific achievement."

Of nine developmental power reactors (including Fermi) licensed to date by AEC for construction, the government brief stressed the Commission's full consideration of pertinent criteria for safety of operations in each case, but noted that no findings were made of "compelling reasons" in those cases where reactors are located near densely-populated areas.

If the Fermi petition is granted further review, oral arguments presumably will be scheduled shortly after the first of the year.

The shell of the once hotly-controversial Dixon-Yates agreement will come before the court. At issue is about $2 million of costs incurred by Mississippi Valley Generating Co before the cancellation of a contract to build a dam to supply power to the Atomic Energy Commission. The company claims the government should pay these expenses; the government says no.

A contract between Tampa Electric Co and a West Kentucky Coal Co subsidiary will be reviewed by the court. The pact called for delivery of coal to Tampa's Gannon station over a 20-year period. West Kentucky claims the agreement violates the Clayton Antitrust Act.

Other Power Cases Pending

Other power cases confronting the court are:

- A dispute between Central Illinois Public Service Co and Illinois Central Railroad Co over who will pay the $147,000 cost of changing the circuitry of an automatic signal system on a 121-mile stretch of Illinois Central's road.
- Rate increases of about 20% by the municipally-owned Memphis, Tenn., power plant. The Memphis AFL-CIO Labor Council claims the increase was unnecessary and asks for refunds to power customers which total about $3 million and grows $500,000 monthly.
- Claims by Citizens Utilities Co, a small Vermont power company, that the FPC has no jurisdiction over the Clyde River, a 27-mile-long stream on which Citizens has several hydro plants.

US NEGOTIATING TEAM is composed of, from left, Lt Gen Charles Itschner, US Corps of Engineers; I. B. White, State Department, and E. F. Bennett, Interior

US, Canada Agree on Terms

Canadian and American negotiating teams have agreed on the terms to be written into a treaty governing the joint development of the water resources of the upper Columbia Basin, one of the world's greatest untapped sources of hydro power. The development will involve capital expenditures estimated at $3 to $4 billion and boost the power output of Columbia River hydro plants by 9,000 Mw.

Basic elements of the plan are the creation of storage reservoirs, mainly in Canada, to hold the early summer freshets from Canadian Rockies and release them in a controlled year-round flow through downstream power plants, most of them in the United States.

Details of the agreement will be disclosed later by the two governments but, in general, they are in accord with the principles recommended earlier by the International Joint Commission. Chief of these was the proposition that one half of the increase in power generated at downstream plants as a result of Canadian storage and control works should belong to Canada and be moved across the border for use in British Columbia.

Elmer F. Bennett, assistant secretary of the Interior and chief of the US negotiating team, and Canadian Justice Minister E. Davie Fulton, head of the Canadian team, both profess confidence the recommendations of the negotiators will be accepted and that work will soon start on drafting a treaty.

Bennett told *Electrical World* that action in Washington would not be affected by the presidential election. He was satisfied the treaty would be submitted to Congress for ratification in January. It would require a two-thirds affirmative vote in the Senate.

Fulton, who represents a British Columbia constituency in the House of Commons, said he was sure the treaty would be ratified by the Canadian parliament in time for a start on the work in 1961. He said he would be greatly embarrassed if this didn't happen, and since the Canadian government commands a heavy majority in the House of Commons ratification is virtually certain.

Bennett, however, puts in a reservation about getting down to business in 1961. He said there was no assurance how quickly the Senate would act on the treaty.

Canada is expected to build High Arrow Dam on the Columbia first, and the US is believed to have gotten Canadian approval to build its proposed Libby Dam on the Columbia in Montana—backing water across the border into British Columbia. Canada's Mica Creek Project may be started about the same time as High Arrow.

This agreement, although still tentative, is considered a political victory for both the US and Canadian Administrations, which may use it to improve their chances at the polls later this year in elections on both sides of the border. The Ottawa meeting in September didn't settle all the details needed for a treaty, but it did resolve the serious general terms and major issues; loose ends will be wrapped up after the British Columbia hearings.

Co-op and Company Studying Joint Allegheny Development

An unusual example of coordination between a co-op and an investor-owned utility was disclosed recently as Pennsylvania Electric Co and Warren Electric Cooperative, Inc, announced joint plans to study the power potential of the Kinzua Dam, now being built on the Allegheny River by the Corps of Engineers.

In separate applications, the two organizations have asked the Federal Power Commission to grant them priority on a license while the studies are being made. Under the proposals, whose feasibility is to be determined:

- Warren Electric would build a hydro generating station adjacent to Kinzua Dam, eight miles upstream from Warren, Pa. Its capacity, using run-of-river flow, would be about 17.5 Mw. A possible re-regulating dam, 2.5 miles downstream, would boost output to 30 to 75 Mw. A pumpback scheme, also in the proposal, would provide an output between 50 and 125 Mw.
- Pennsylvania Electric would construct a pumped storage project which would include a one-mile dia storage pond about 700 ft above the river and have a capacity between 75 and 300 Mw. The power plant would be located between the storage pond and the reservoir.

Both projects would be operated by Penelec, which would transmit the power over its lines to 13 Pennsylvania cooperatives supporting the application.

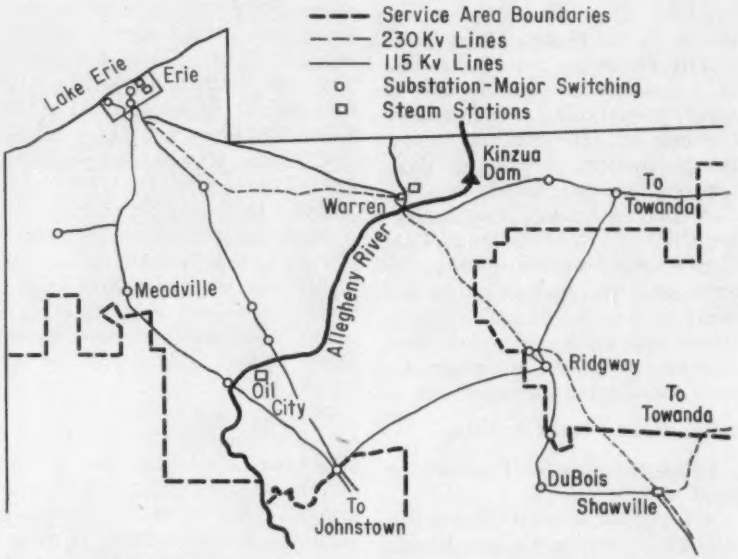
The Kinzua Dam, built primarily for flood control and low flow augmentation, will rise 179 ft above the river bed. It will form a reservoir of 1,180,000 acre-ft.

Although the Corps of Engineers in 1957 reported that power generation at Kinzua was not economically justified, Penelec claims that recent developments of large pump-generators make it possible to generate a certain amount of power without harming the flood control features. Penelec's sizable transmission system, serving a wide geographic area, and its substantial coal-fired generation also contribute to the project's feasibility.

The company serves 400,000 customers in 32 Pennsylvania counties. The 13 co-ops, which serve about 77,000 customers in the same area, currently buy about 95% of their power needs from Penelec.

Both Warren and Kinzua Projects will be operated by remote control from Penelec's Warren steam plant.

In asking the FPC to approve both applications, Louis H. Roddis, Penelec president, and Maxwell D. Rhodes, general manager of the Warren co-op, asserted, "We believe the best interests of our customers, of local communities, of the state and federal governments, and all taxpayers will be served by this joint development of whatever power potential exists at Kinzua."



KINZUA IS LOCATED in the heart of the northwestern corner of Penelec's system

Basin Compact Ready for States' Vote

Legislatures of seven Pacific Northwest states will be asked to approve a compact for the use of water resources in the Columbia River Basin, as the result of action by the Columbia Interstate Compact Commission.

Compacts have been submitted for state approval in two earlier instances, in 1955 and 1957, but only the Idaho legislature took action. To become effective, the agreement must be ratified by Washington, Oregon, Idaho and Montana and also by Congress. It also will be submitted to the legislatures of Nevada, Wyoming and Utah but does not need their approval for implementation.

The agreement assures upstream states of most of the power produced at dams within their borders. It seeks to "facilitate and promote the orderly, integrated and comprehensive development, use, conservation and control" of the Columbia River and its tributaries.

In addition to power and water resources, a commission established by the pact would supervise development of fish and wildlife and recreation facilities. The commission would also provide pollution control methods.

It would be empowered to cooperate with the International Joint Commission on projects which might affect the uses of Columbia River Basin waters.

Contract Squabble Dims Oroville Prospects

Chances of California voters approving a bond issue in November for the state's huge water project received a serious setback last month when the Metropolitan Water District continued to withhold its support for the measure.

The MWD, California's largest wholesale water agency, has consistently refused to endorse the plan that would permit it to distribute 1.5 million acre-ft of Northern California water in its Southern California service area, comprising a population of some seven million. The District has insisted that it first must have an "acceptable contract."

After months of negotiation, Gov E. G. Brown submitted his version of what he termed a "final" contract to the District, which promptly rejected it as "unacceptable."

Seeks Assurance on Costs

Deadline for the final contract had been set for Sept. 13 and then extended to Sept. 27. After studying Brown's version of the contract on Sept. 13 the MWD registered disappointment and sought a further personal meeting with the governor. That meeting broke up with their differences still unresolved. Neither side budged from its position.

The position of the MWD is that it must have firm assurances that it will get its fair share of Feather River water and that it will pay no more than its fair share of the total cost of the project. These assurances, the District insisted, should be confirmed in a contract prior to putting the proposition before the voters in the Nov. 8 general election.

In the opinion of the MWD, Brown's proposal not only fails to give these assurances, but makes any contract subject to approval by the 1961 legislature.

Charles C. Cooper Jr, general counsel of the MWD, said that the governor's document is, therefore, no contract. And the District holds that if the contract will be subject to statutes later enacted by the legislature, then the bond election ought to be postponed.

Also omitted from Brown's "final" draft was an MWD proposal that those contracting for the water pay 75% of the cost for water conservation facilities such as Oroville Dam.

Warren Butler, vice chairman of the MWD's board of directors, said, "We feel that when people are asked to write a check they should know what the terms are and what they are writing it for. That is what we have been trying to obtain in asking for a contract before the election."

In June the District had drafted its own proposed contract because it felt the state was dragging its heels in the matter. That draft pointed up two prime areas of disagreement with the governor's "contracting principles."

The MWD draft had provided for application of the power revenues without regard to whether consumptive use of water purchased from the state was made on land of the same ownership in excess of 160 acres, and also a provision for apportionment of the costs of transportation facilities on the basis of allocated flow capacity.

While the state has expressed an unwillingness to pass on the rate benefits which accrue from power sales to those users owning more than 160 acres, the MWD takes the stand that all consumers should participate in the benefit.

Further, the District protests that it would have to pay for peak transportation facilities that the agricultural areas would require unless costs were based on allocated flow capacity. It was pointed out that the agricultural areas of the state need a lot of water for a few months of the year and very little for the rest of the year. In total consumption, the MWD's primarily urban users would take more water in a 12-month period, but the flow would be relatively uniform and thus the District would not require as large an aqueduct as would be required by the irrigation districts.

The MWD, therefore, urges that the cost of transportation facilities be based on allocated flow capacity rather than on total annual delivery as proposed by Gov Brown.

On the other hand, the governor maintains that the District's proposal would reduce its costs by 1.2% but would boost costs in the agricultural San Joaquin Valley by nearly 7%.

Brown also rejected the District's request to be given the right to determine whether and when the east and west branch aqueducts in its service area should be built. The governor holds that this might curtail water services to some areas.

TVA to Market Power Bonds in November

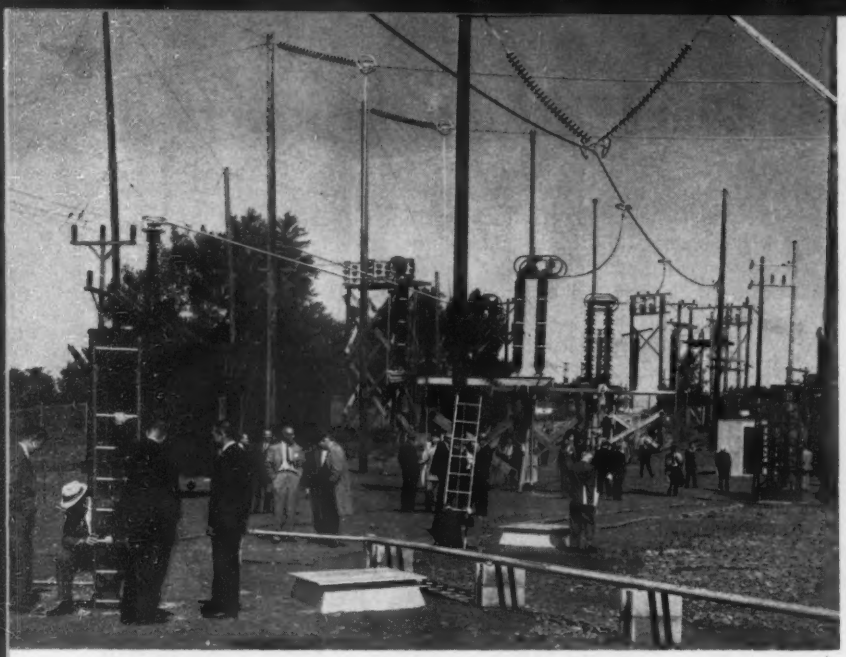
The Tennessee Valley Authority has announced plans to sell publicly $50 million of power bonds on Nov. 15. The announcement came as the TVA's 500-Mw Widow's Creek Plant, the world's largest steam generating unit, began its initial tests.

The offering will be the first under the 1959 federal legislation which authorized TVA to issue up to $750 million in bonds. Details of the terms and conditions of the securities will be announced early this month.

The bonds will be used to help finance new generating capacity and will be payable entirely from the net proceeds of the Authority's power system, currently running about $100 million. Bond interest is subject to federal income tax, but not subject to state or local taxes.

Assets of the TVA power system are valued at about $1.8 billion, of which two-thirds is derived from federal appropriations. Approximately $250 million of these appropriations has been repaid to date.

The revenue bond legislation requires the TVA to repay $1 billion of the present appropriation investment over a 54-year period. In addition, it must pay the Treasury, each fiscal year, a return on the unpaid balance which conforms to the average interest rate payable on the Treasury's total marketable public obligations at the beginning of such year. As of last June 30, this rate was slightly below 3.5%. Debt service on TVA's power bonds takes priority over the Authority's payments to the Treasury.



Cable engineers inspect 345-kv buses and get . . .

inside look . . .

$3 Million Cornell EHV Cable Test

The Cornell extra-high-voltage cable testing station was officially energized last month at a brief ceremony at Cornell University, Ithaca, N. Y. The station represents an investment of $3 million by the utility and cable industries, and is a cooperative project of the Assn of Edison Illuminating Companies, Edison Electric Institute, and a group of 27 electrical manufacturers, in addition to Cornell.

Conceived in 1953, the new EHV research facility has been designed and built to carry out a program of field service tests on underground cable systems designed for 345 kv and 500 Mva. Objectives of the program are to evaluate the mechanical and thermal performance and measure the losses of cable and ac-

Project Will Test Four Types of Cable

Low Pressure Self-Contained Oil-Filled Cable 1700 MCM, profile copper conductor (with 0.69 ID core); strand shielding; one-in. wall of oil-impregnated paper insulation; insulation shielding; 170-mil F-3 lead sheath; stainless steel tape reinforcement; and 175-mil polyethylene jacket. Two cables installed in a 4-conduit duct-bank and under nominal 12 psig pressure with oil reservoirs. Supplied by Anaconda Wire & Cable Co.

High Pressure Self-Contained Oil-Filled Cable 2000 MCM, copper compact-segmental conductor (6 segments annealed, with 0.69 ID core); strand shielding; one-in. wall of oil impregnated paper insulation; insulation shielding; 220-mil aluminum sheath; and 120-mil high-density, high-molecular weight polyethylene jacket. Two cables installed in a 4-conduit duct-bank and maintained under nominal 200 psig pressure with a pumping plant. Supplied by Phelps Dodge Copper Products Corp.

High Pressure Oil Pipe-Type Cable (Oilostatic) 2000 MCM, copper segmental conductor; strand shielding; one-inch wall of oil-impregnated paper insulation; insulation shielding; polyester film and fabric insulation (for test purposes) over insulation shielding; and bronze armor D-wire. Two cables installed in 10¾ in. OD steel pipe, which is filled with oil and maintained under nominal 200 psig pressure with a pumping plant. Furnished by The Okonite Co.

High Pressure Oil Pipe-Type Cable 2000 MCM, copper concentric enameled strand; strand shielding; one-inch wall of oil-impregnated paper insulation; insulation shielding; moisture seal and shielding assembly; and polyethylene (for test purposes) skid wire. Two cables installed in 10¾ in. OD steel pipe, which is filled with oil and maintained under nominal 200 psig pressure with a pumping plant. Contributed by General Cable Corp.

at cable vaults and joints . . .

in dedication ceremonies as . . .

Project Is Energized

cessories. The program is the outgrowth of the upsurge in overhead transmission voltages and power plant and turbine-generator unit size in the last decade, and the accompanying need for high capacity underground cable systems.

Testing at the EHV cable research center is expected to be completed in three years. During the first two years, cable voltage will be raised in steps from 345 to 415 kv, with loading temperatures comparable to commercial operating conditions. In the final year of tests, cable temperature will be further increased and voltages raised to 500 kv in an effort to evalulate ultimate capability of the cable circuits.

Four different EHV cable types have been developed and sample lengths contributed to the test project by four cable manufacturers:

(1) A low pressure lead sheath, self-contained oil-filled cable;

(2) A high-pressure oil pipe-type cable;

(3) A high-pressure oil pipe-type (Oilostatic) cable;

(4) High-pressure, self-contained, oil-filled cable.

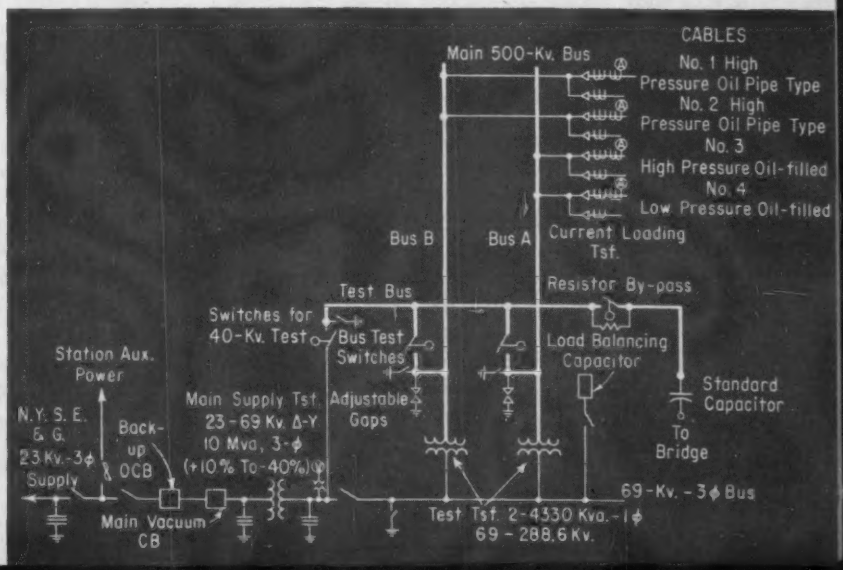
Special EHV terminal potheads were furnished for the cable test project by G&W Electric Specialty Co and Ohio Brass Co.

Other equipment and special services necessary for the success of the station were contributed by 21 other manufacturers. A group of 24 investor-owned utilities are supporting the project financially.

Speaking at the opening ceremonies in behalf of the 15-man joint AEIC-EEI-Manufacturers Steering Committee that guided development of the test station, Chairman L. I. Komives, Detroit Edison Co, pointed out that the Cornell EHV cable test station is the first of its kind in the world developed and built entirely by private enterprise.

Prof Dale R. Corson, Dean of Engineering at Cornell, said that the University can contribute to cable progress by training people in high-voltage cable technology and by coordinating cable test findings with work at the University in molecular research and materials development to improve the quality of future power cable systems.

Close liaison will be maintained between the Cornell Cable Test Program and the work of the University's new Materials Laboratory. The Laboratory and the Test Station will supplement each other in the development and testing of new engineering materials for cables.



News Scope

Britain Changes A-Policy

In a major shift in atomic research policy, the British Atomic Energy Authority has shelved for at least three years plans to build another massive fusion power machine.

Instead of concentrating on toroidal machines like Zeta that proved unsatisfactory, money for future research and the services of Britain's relatively few thermonuclear researchers will be spread over a number of "smaller but important experiments."

An Authority spokesman, announcing the change, emphasized that fusion research was not being abandoned.

The Authority's policy was altered when it appeared that a machine, called the Intermediate Current Stability Experiment, now being constructed, would cost at least twice the anticipated $4.2 million. The Experiment, Britain's prime fusion power research tool, will now be scrapped.

Co-op Station Planned

Detroit Lakes, Minn.—Plans for building a $30-million 200-Mw steam plant on the Mississippi River by the Co-operative Power Assn (CPA) are under study, CPA officials disclosed here.

The proposed plant, location of which has not been decided, would be financed by Rural Electrification Administration. It probably would be leased to Northern States Power Co for operation with existing integrated systems.

Colorado-Ute Expanding

A $2,920,000 loan for Colorado-Ute Electric Assn has been approved by the Rural Electrification Administration. The utility will use the loan to buy power from the Bureau of Reclamation's Collbran Project for the growing power demands of its four member cooperatives, and to provide power-supply facilities to a new member, the Grand Valley Rural Power Lines of Grand Junction.

Colorado-Ute is negotiating with the Bureau of Reclamation for the purchase of Collbran Project's entire output, about 13 Mw. This, plus the 31,700-kw firm capacity of its Nucla steam generating plant, will enable Colorado-Ute to meet its members' power needs through 1965.

Dateline . . . The Campaign Trail (*Continued from page 5*)

system which treats capital invested in a wholly self-liquidating power project the same as an expenditure which cannot be recovered;

(6) "We will restore REA to its former role of pre-eminence;

(7) "Our goal must be the fullest utilization of every drop and gallon of water in every river system in America;

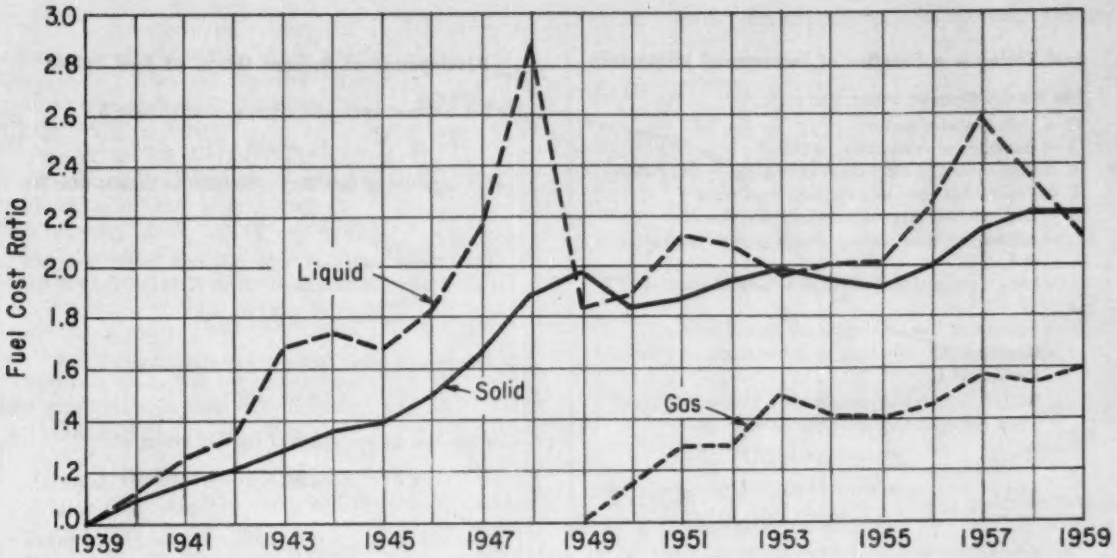
(8) "We will restore American leadership in atomic development;

(9) "We will (inquire) . . . into methods of preventing evaporation, of controlling weather, of retaining snow packs, and—above all—of converting salt water into fresh water."

Chicago—Vice President Richard Nixon and Sen Kennedy made the following comments on the nation's power policies in the first of their four "great debates" on television.

Nixon: "We have developed more hydroelectric power in these seven and one-half years than was developed in any previous administration . . . Too often in appraising whether we are moving ahead or not, we think only of what the federal government is doing. Now, that isn't the test of whether America moves. The test of whether America moves is whether the federal government, plus the state governments, plus the local governments, plus the biggest segment of all—individual enterprise—moves. This Administration has encouraged individual enterprise, and it has resulted in the greatest expansion of the private sector of the economy that has ever been witnessed in an eight-year period, and that is growth."

Kennedy: "Here in the United States, which developed the Tennessee Valley and which built the Grand Coulee and the other dams in the Northwest, at the present rate of hydro power production—and that is the hallmark of an industrialized society—the Soviet Union by 1975 will be producing more power than we are. I want individuals to meet their responsibilities, and I want the states to meet their responsibilities, but I think there is also a national responsibility. The people of the United States, individually, could not have developed the Tennessee Valley. Collectively, they could have. On the question of the development of natural resources, I would 'pay as you go,' in the sense that they (multi-purpose projects) would be balanced and the power revenues would bring back sufficient money to finance the projects in the same way as the Tennessee Valley."



EAST COAST FUEL PRICE TRENDS reflect not only technological factors but also the trend of the purchasing power of the dollar. Fuel price trends indicate that provision must be made for an increasing fuel cost

Gross Return Tests Plant Design

Mathematical method is developed to show whether a new steam station design will earn the required net rate of return

P. SICHEL, J. H. POTTER, Gibbs & Hill, Inc, New York, N. Y.

Power plant engineers must continually analyze the probable long-term economic benefits of incorporating into their plants any new engineering designs that promise improvement in plant performance. The incremental cost of these designs must be weighed against the rate of return to justify the additional investment. Gross rate of return on a new plant at the end of its first year can be a significant parameter in the economic analysis of new designs.

For a given set of conditions, the relation of this gross return to the net return over the life of the unit can be determined. This relation will show whether the new designs will earn the required net rate of return. It will also aid in the economic analysis of a choice among several new engineering designs that offer improved plant performance.

The relation of the first year's gross return to required rate of return over the plant's expected life is the key to this analysis. The required rate of return can be explored on the basis of a present-worth calculation, with consideration given to expected unit loading and the probable trend in fuel costs. Determination of this relation involves a knowledge of the fixed charges on the incremental investment in the new engineering designs being considered. These fixed charges will include taxes, depreciation and interest.

Federal taxes are set by the statutory tax rate and the amount of the taxable income. The rate structure of the utility will determine the amount of taxable income. As this rate structure is related to the company's capitalization, federal taxes in turn can be expressed in terms of plant investment. In this analysis, constancy of tax rates, as well as insurance rates, is assumed.

It also is assumed that the salvage value of the plant will be equal only to the cost of dismantling and removing the equipment and that depreciation is charged as a fixed percent of the investment. Interest is charged on the basis of the bonded ratio of the utility's total capitalization.

Effects of these several variables can be combined to calculate the rate of return. For this calculation, assume that a choice of thermal cycles, including a new design, is available and that a greater investment is required for the more efficient cycle. As shown in an accompanying box, the saving in fuel costs from the more efficient cycle can be expressed as a function of the incremental investment, or:

$$S = (\theta I) \ldots\ldots (1)$$

A study of the general trend in fuel prices indicates that provision must be made for an increasing fuel cost. Thus, the fuel cost at any time, X, can be represented by $\psi(X)(F)$, where $\psi(X)$ is the factor expressing the increase in fuel cost with time.

Experience in the utility industry has shown that a new unit will not be run at full capacity over its entire life. As times goes by the unit will carry less load, the rate of load decrement being dependent upon the growth pattern of the sys-

Fuel Saving Is a Function of Incremental Investment

For the development below, let:

C = Unit capacity factor
I = Incremental investment, dollars
S = Fuel saving @ 100% load during first year, dollars
T = Federal tax rate, as a decimal fraction of I
d = Depreciation rate, as a decimal fraction of I
i = Adjusted interest rate on bonds, as a decimal fraction of I
t = local taxes and insurance, as a decimal fraction of I
D = (d + i + t)
F = Initial fuel cost, in dollars per unit of energy
r = Required rate of return on investment, as a decimal fraction of I

With federal tax expressed as : T(S − DI)
Then net operating saving after taxes is:

$$(1 - T)(S - DI)$$

And net revenue to yield the required rate of return is:

$$(rI) = (1 - T)(S - DI) + (iI)$$

Solving this equation for fuel saving (S) yields:

$$S = [D + (r - i)/(1 - T)]\ I$$

The expression inside the brackets is the gross return required to produce the net rate of return, r, Then, defining this expression as θ:

$$S = (\theta I) \quad \ldots\ldots (1)$$

Development of Present Worth of Fuel Saving

Let fuel cost vary with time, so that at time X:

$$F_x = \psi(X)(F)$$

Let capacity of unit vary with time, so that at time X:

$$C_x = \phi(X)$$

Fuel saving will vary with fuel cost factor and unit capacity factor, so that at any time, X fuel saving will be:

$$[\psi(X)][\phi(X)]\ S$$

The present worth factor at any given time will be:

$$1/(1 + \theta)^X$$

Then, the present worth of the fuel saving is:

$$PW = [\psi(X)][\phi(X)][1/(1 + \theta)^X](S)$$
$$= \zeta(S) \quad \ldots\ldots (2)$$

Over the life of the unit, the sum of the present worth values should be equal to, or greater than, the incremental investment:

$$\Sigma(PW) = \Sigma(\zeta)S \geqq I$$

$$\frac{S}{I} \geqq \frac{1}{\Sigma(\zeta)} \quad \ldots\ldots (3)$$

Effect of Principal Variables on Ratio (S/I) of Fuel Savings to Incremental Investment

1 Year	2 Fuel Saving Dollars/year (uncorrected)	3 Capacity Factor	4 Present Worth for 6%	5 (2×3×4)	4a Present Worth for 2.03%	5a (2×3×4a)	4b Present Worth for 3.67%	5b (2×3×4b)	4c Present Worth for 10%	5c (2×3×4c)
1	S	0.82	0.8673	0.7112S	0.9346	0.7664S	0.9091	0.7455S	0.8088	0.6632S
2	1.01 S	0.85	0.7522	0.6458S	0.8734	0.7498S	0.8264	0.7095S	0.6543	0.5617S
3	1.01^2 S	0.87	0.6524	0.5790S	0.8163	0.7245S	0.7513	0.6668S	0.5292	0.4697S
4	1.01^3 S	0.85	0.5658	0.4955S	0.7629	0.6681S	0.6830	0.5982S	0.4280	0.3748S
5	1.01^4 S	0.80	0.4907	0.4085S	0.7130	0.5935S	0.6209	0.5168S	0.3462	0.2881S
6	1.01^5 S	0.77	0.4256	0.3444S	0.6663	0.5392S	0.5645	0.4568S	0.2866	0.2319S
7	1.01^6 S	0.75	0.3691	0.2938S	0.6227	0.4957S	0.5132	0.4086S	0.2264	0.1802S
8	1.01^7 S	0.73	0.3201	0.2505S	0.5820	0.4555S	0.4665	0.3651S	0.1833	0.1435S
9	1.01^8 S	0.72	0.2776	0.2164S	0.5439	0.4240S	0.4241	0.3306S	0.1485	0.1157S
10	1.01^9 S	0.71	0.2408	0.1870S	0.5083	0.3947S	0.3855	0.2993S	0.1099	0.08532S
11	1.01^{10} S	0.70	0.2089	0.1615S	0.4751	0.3673S	0.3505	0.2710S	0.09599	0.07421S
12	1.01^{11} S	0.68	0.1812	0.1375S	0.4440	0.3368S	0.3186	0.2417S	0.07843	0.05950S
13	1.01^{12} S	0.67	0.1571	0.1186S	0.4150	0.3133S	0.2879	0.2174S	0.06345	0.04791S
14	1.01^{13} S	0.65	0.1363	0.1008S	0.3878	0.2869S	0.2633	0.1948S	0.05132	0.03797S
15	1.01^{14} S	0.61	0.1182	0.0829S	0.3624	0.2541S	0.2394	0.1678S	0.04151	0.02905S
16	1.01^{15} S	0.56	0.1025	0.0666S	0.3387	0.2202S	0.2176	0.1415S	0.03436	0.02234S
17	1.01^{16} S	0.51	0.0889	0.05316S	0.3166	0.1893S	0.1978	0.11835	0.02716	0.01624S
18	1.01^{17} S	0.43	0.0771	0.03926S	0.2959	0.1507S	0.1799	0.09161S	0.02196	0.01118S
19	1.01^{18} S	0.37	0.0669	0.02961S	0.2765	0.1224S	0.1635	0.07236S	0.01781	0.00667S
20	1.01^{19} S	0.31	0.0580	0.02172S	0.2584	0.09677S	0.1486	0.05565S	0.01437	0.00473S
21	1.01^{20} S	0.27	0.0503	0.01657S	0.2415	0.07955S	0.1351	0.04450S	0.01162	0.00289S
22	1.01^{21} S	0.23	0.0436	0.01236S	0.2257	0.06396S	0.1228	0.03480S	0.00940	0.00266S
23	1.01^{22} S	0.20	0.0378	0.00941S	0.2109	0.05249S	0.1117	0.02780S	0.00761	0.00189S
24	1.01^{23} S	0.18	0.0328	0.00742S	0.1971	0.04460S	0.1015	0.02297S	0.00615	0.00139S
25	1.01^{24} S	0.16	0.0285	0.00579S	0.1842	0.03741S	0.0923	0.01875S	0.00498	0.00101S
26	1.01^{25} S	0.13	0.0247	0.00412S	0.1722	0.02870S	0.0839	0.01399S	0.00412	0.00069S
27	1.01^{26} S	0.12	0.0214	0.00333S	0.1609	0.02500S	0.0763	0.01186S	0.00326	0.00051S
28	1.01^{27} S	0.12	0.0186	0.00292S	0.1504	0.02360S	0.0693	0.01087S	0.00264	0.00041S
29	1.01^{28} S	0.11	0.0161	0.00234S	0.1406	0.02043S	0.0630	0.00915S	0.00213	0.00031S
30	1.01^{29} S	0.11	0.0140	0.00206S	0.1314	0.01929S	0.0573	0.00841S	0.00172	0.00025S
31	1.01^{30} S	0.10	0.0121	0.00163S	0.1228	0.01655S	0.0521	0.00702S	0.00129	0.00017S
32	1.01^{31} S	0.10	0.0105	0.00143S	0.1147	0.01561S	0.0474	0.00645S	0.00113	0.00015S
33	1.01^{32} S	0.10	0.0091	0.00125S	0.1072	0.01474S	0.0431	0.00593S	0.00091	0.00013S
				$\Sigma = 5.0144S$		$\Sigma = 8.5913S$		$\Sigma = 6.8918S$		$\Sigma = 3.4364S$

tem. To properly allow for the effects of obsolescence, it is important to predict the capacity factor of the unit as a function of time.

Predicting the shape of the capacity factor-time curve requires a knowledge of the system and the performance and timing of new units. Specifically it is necessary to know the total growth trend of the utility; the location, performance and sizes of existing and future units in the system; the probable time at which new units will be added; and the locations and times at which old equipment will be taken out of service.

Because of the many unknown and intangible factors that will affect the operation of the unit over the predicted life, it would seem desirable to represent the capacity factor as a simple function of time. This would allow the use of a simple analytical form, $\phi(X)$. Use of this form would make possible an algebraic solution to equation (2) for the present worth of the fuel saving, with a more rapid determination of the gross rate of return at the end of the first year.

Development of the present worth (PW) of the fuel saving, corrected for variations in fuel cost and capacity of the unit, is shown in an accompanying box. This can be expressed as:

$$PW = f(S) \quad \ldots\ldots \quad (2)$$

Over the life of the unit, the sum of the present worth values should be equal to, or greater than, the incremental investment:

$$\Sigma(PW) = \Sigma(f)S \geq I$$

$$S/I \geq 1/\Sigma(f) \quad \ldots\ldots \quad (3)$$

In other words, the ratio (S/I) of the net fuel saving at 100% load during the first year to the incremental investment is equal to the reciprocal of the summation of all the adjusted present worth factors over the life of the unit. From this a curve may be prepared showing the change of (S/I) with net rate of return, r. This curve can provide a useful tool in the estimation of the actual rate of return for any given improvement. Where the capacity factor curve cannot be reduced to the simple analytical form $\phi(X)$, the problem must be set up in

(*Continued on page* 96)

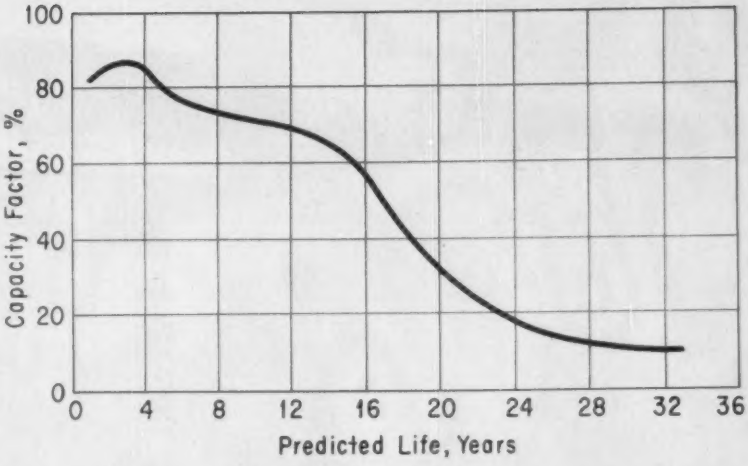


FIG 1—**CAPACITY FACTOR-TIME CURVE** is affected by many unknown and intangible factors. Analysis of a new design is simplified by assuming a simple capacity factor-time curve

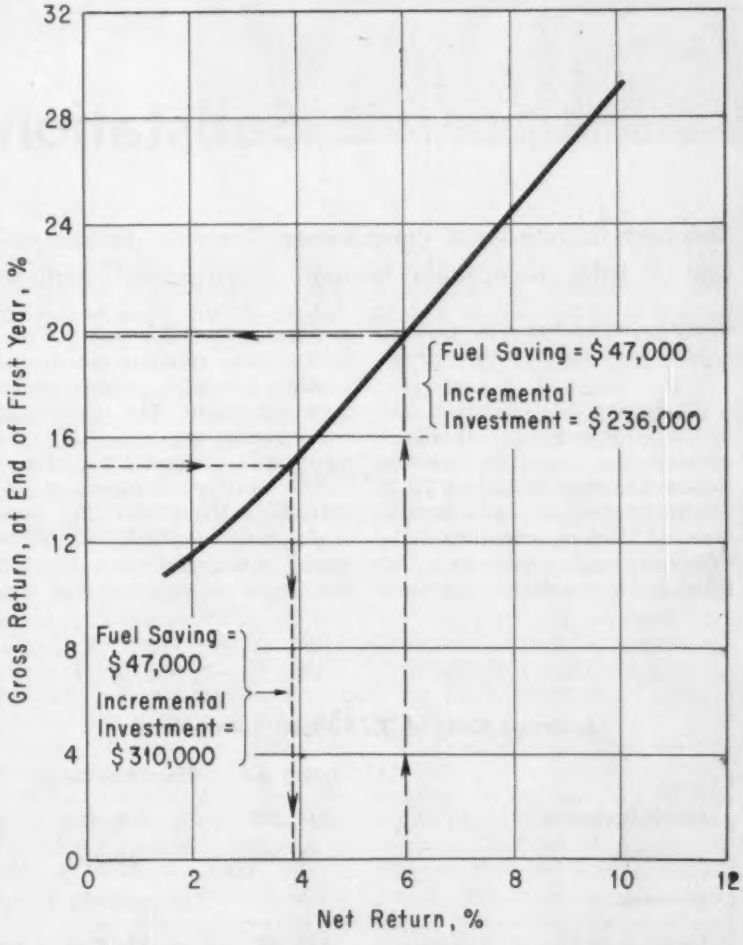


FIG 2—**RELATION OF GROSS AND NEW RETURNS** for a given utility helps to find the maximum incremental investment for a required net or the expected net return for a given investment

Substation Design Saves

Stripped to functional components, Brockton Edison design is safe, acceptable through underground features

HARRY L. SWICEGOOD, Chief Engineer, Brockton Edison Co, Brockton, Mass.

A distribution substation, designed to include only functional elements, was erected by Brockton Edison Co at a saving of $2.35 per kva over the cost of a conventional 3,750-kva substation. The simplified unit's components are themselves conventional, and hence interchangeable. But they are limited to those affording the desired capacity, reliability, voltage regulation, and safety. The design also encompasses provisions for the substation's acceptable appearance.

This distribution substation, essentially a transformer and three single-phase step regulators, had an overall cost considerably less than that of the conventional type substation and sacrifices no essential or important feature of the distribution system as a whole. Of the company's 24 conventional unit-type, single-circuit substations, six with a rating of 3,750 kva were installed in the five years before installation of the simplified substation of the same rating. Average installed costs of both types are compared in the accompanying table.

Average Cost of 3,750-Kva Substations

	Unit Type	Simplified Design
Station Equipment	$47,500	$28,500
Installation	15,000	20,250
Structures	.....	5,250
Total	$62,500	$54,000
Cost per Kva	$16.75	$14.40

The Massachusetts utility worked out the simplified design in accordance with these principles:

1. The transformer alone contributes to substation capacity.

2. Maximum advantage should be taken of protective and other elements, particularly automatic circuit reclosers, built into the supply lines and distribution primaries.

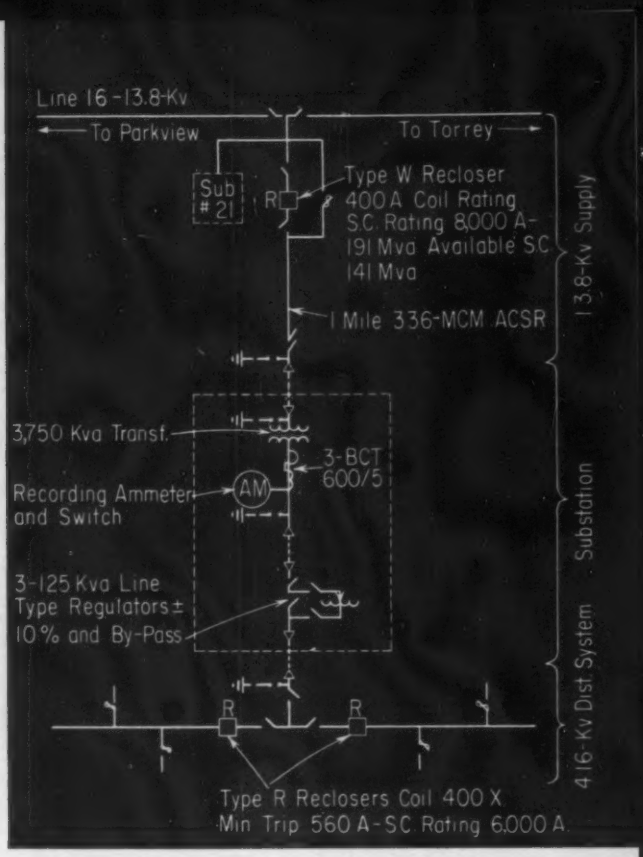
3. Regulation should be minimized to the essential and that, in turn, made independent of the transformer's operation.

4. No live parts should be accessible.

5. Feeder breakers, substation lot fencing, and other non-functional features should be eliminated.

6. Landscaping should be simple and in keeping with substation's

SUBSTATION COMPONENTS are reduced to transformer and regulators, no live parts being accessible and appearance suitable to environment



SCHEMATIC shows disposition of functional components. Supply line and substation are treated as integral

$2.35 Per Kva

residential-industrial environment.

The capacity design requirement was met by a 3,750-kva, 13.8/4.16-kv transformer without load tap changing. It has underground primary and secondary cable compartments. Its size meets the requirements of system planning for its selected site. As the company has settled on a standard-rating distribution substation with the prospect of future system expansion, the substation components are more or less interchangeable among substations.

The system is protected by treating the 13.8-kv supply line and the substation as an integral unit, furnished at the source with a Power Class III, 3-phase 13.8-kv automatic circuit recloser of 8,000-amp interrupting capability. The recloser senses faults beyond the two Power Class II, 3-phase automatic circuit reclosers on the distribution primaries on the street just outside the substation.

The substation is on a T-shape concrete slab, the T's cross facing the street. The transformer is on the T's tail; the three step regulators on the cross. The regulators are in a cement-block enclosure having a corrugated transite roof. The 13.8-kv supply to the transformer comes by underground cable in conduit from the riser pole. Connections from the transformer secondary to the regulators are cable in conduit which goes under the T-shape slab. Connections between the regulators and 4-kv riser pole are cable in conduit also.

Sound Suppressed

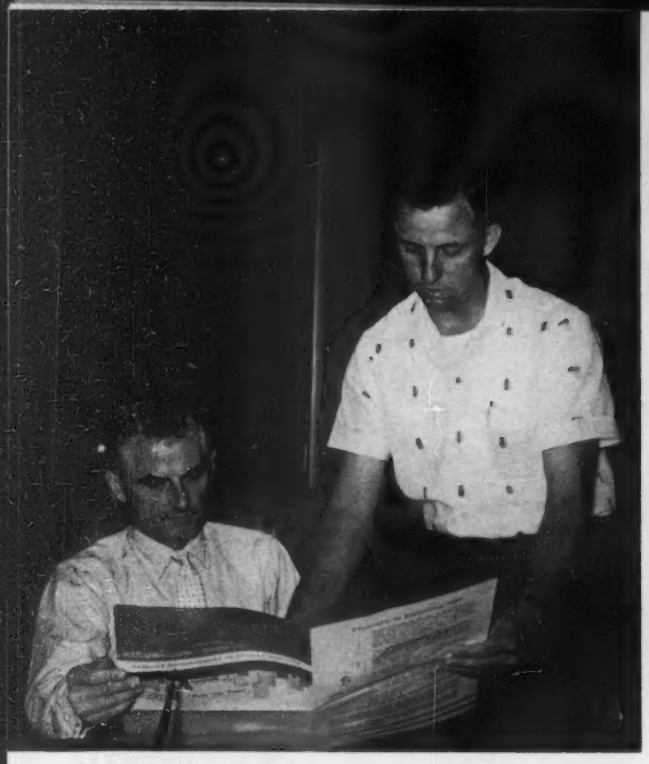
The company decided for reasons of initial cost and future maintenance outlay to use three 125-kva single-phase step regulators rather than a greater number of smaller regulators on the distribution primaries. This arrangement takes advantage of the load diversity on the several primary branches.

Bypass switches in the regulator house permit removing individual regulators for servicing and may be worked by an operator with a switch stick outside the regulator house. The concrete housing between the transformer and residences across the street affords some sound attenuation.

Instead of surrounding it with a steel wire fence, the company left the substation lot open. The estimated cost of underground connections is about equal to that of aerial connections along with fencing. Besides being safer, the chosen arrangement looks better.

A stone, factory-type building was the background of the first installation. Only the concrete face of the regulator house could be seen from the street. Accordingly, a few standing trees and a lawn were enough to make up the landscaping. In general, the masonry wall with a stucco finish, the company believes, has a more acceptable appearance than a metal-clad structure and takes a minimum of maintenance.

Facilities for switching on the 13.8 and 4.16-kv risers and connections to the line side of the regulators permit the use of the company's mobile substation in an emergency or for routine maintenance. This equipment replaces the station transformer, the regulators remaining in service. The regulators can be taken out of service individually while the station transformer stays in.



TWO-COLOR BROCHURE was used by public information department to explain electrical and construction facts

ROAD SIGNS told growth story as here where manhole is being built before new 11-story Mayer building

Public Is 'Sold' on Main-Stem

DON BOILLOT, Publicity Section, Arizona Public Service Co, Phoenix, Ariz.

Planning, consideration, the personal touch—these are the touchstones to winning public tolerance of main-street construction. Arizona Public Service Co used them effectively, once it decided to install an underground electric system along a section of Phoenix's busiest street.

That city's population today is 430,000, four times what it was in 1950. This increase is reflected in almost daily major construction projects along its main streets. Most residents look on with resignation, realizing that civic progress has its growing pains. But not all. Some business men, pedestrians, and motorists voice complaints audible over the pneumatic drills.

The utility realized that its underground project would inconvenience some 30,000 motorists who daily use North Central Avenue. It knew such inconvenience would find a voice loud and vehement, that complaining letters would swamp local city rooms, that company officials would be badgered. It saw that it had a peace mission that took priority even over a simple survey.

Gives Public Reasons

First the company's public information department was asked to come up with a program for winning public acceptance. Meeting with other departments—engineering, operations, right-of-way, and sales—it developed a campaign.

Public information's own role was preparation of a two-color brochure explaining to business customers why underground distribution should be built along the main stem. Customers were told that development of part of North Central Avenue was fast loading the present system which served the area to peak capacity. The many multi-story buildings being built or planned necessitated construction of a new system for serving concentrated loads. Customers were told the reasons for going underground. These were:

- The heavy concentration of future loads.
- The need for a more reliable system.
- The city's own program for beautifying its principal artery.

The project, named Reddy Expressway, called for 12 5-in. electrical conduits and two 3-in. communication conduits, the brochure explained further. These were to be encased in 3 in. of concrete and buried in a 10-ft deep trench under the sidewalk. A 17-ton concrete manhole every 600 ft along the route was needed for cable splicing. Of these, 11 would be at street intersections; three at midblock. The system would tie in with a new substation to be built

Phoenix is reconciled to Reddy Expressway when Arizona Public Service presents case for underground system

CONDUIT for underground distribution system is installed in 10-ft deep trench under the sidewalk on east side of Phoenix's main street, N Central Avenue

Distribution Underground

simultaneously two blocks east.

Sales representatives carried the brochures by hand to business customers along the construction route. Besides explaining the project, the brochures thus served as door openers for salesmen in discussing refrigeration, lighting, wiring, and other electrical applications with customers.

Customer response was immediate, encouraging. Representatives reported such comments as: "We're happy to know what's going on," and "This is the first time anyone has ever bothered to tell us about a construction project before it started."

The follow-up on the brochure was a periodic mailing of progress bulletins to construction-area customers. These reported progress and work scheduled. Thus businessmen knew when to expect construction work in front of their establishments. This information enabled a furniture store to time such construction work with a special back-door sale.

Meanwhile, the normal routine publicity releases went to local newspapers, radio and TV stations. Through these a columnist on one of the city's two daily newspapers was able to develop a highly favorable story on the Reddy Expressway. He pointed out that the underground system would preserve the "open-air attractiveness of the city's busiest street."

Consideration Works

Reminding motorists that the project was necessary to the city's growth were four brightly painted 4x10-ft road signs posted near the construction area. On these a smiling Reddy Kilowatt said: "Pardon our progress. This new underground electric system is helping Phoenix grow."

Brochure, representatives, and news media kept telling customers that Arizona PS would do everything within reason to minimize inconveniences. Trench excavation would be in sections not longer than 300 ft. Excavation areas would be kept clean and orderly, and where necessary, dirt would be hauled away and brought back later for refilling.

Crossings and bridges would be built over openings to give the public access to business places. Shrubbery would be carefully removed, stored at a nursery, and replanted after work was completed. Walks, street sections, and other areas would be restored to at least as good condition as before the excavation began.

In the third month the Reddy Expressway was 50% completed. No complaints had been registered. PS officials believe that the public relations program had and would continue to reconcile the people of Phoenix to the temporary, but unavoidable inconveniences incident to the growth of their own city.

Co-op Installs Punched-Card System

New uses continue to be found for equipment installed six months ago; cost is only $1 per year per member

WILLARD GRAGER, Manager, Cass County Electric Cooperative, Inc, Kindred, N. Dak.

An automatic punched-card accounting system is proving a major boon to the Cass County Electric Cooperative, Inc, which has found after using it six months that this equipment has hardly begun to be utilized to its fullest capabilities. Cass County was the nation's first cooperative to install machine accounting.

Thus far, at the cost of $1 per year per member, the cooperative uses the system to compile statistical data on:

- Customer kwhr consumption as compared to capacity capabilities of single-phase lines, multiphase circuits, and substations;
- Line loadings as compared to sectionalizing capacities installed;
- Line loss per substation as a possible indication of needed maintenance to eliminate such faults as branches rubbing lines, faulty insulators, and loose connections.

And the system provides criteria for installation of additional facilities, as indicated by system studies.

In addition, the cooperative uses the system to assist its approximately 6,600 members by providing:

- A monthly billing prepared from a reading each has submitted;
- Automatically on the same bill, information about any debit or credit balance remaining in his account;
- A reminder that the 14th of each month is the proper time to read the meter and make a remittance;
- Automatically on the last day of the month a delinquent notice to any member who may have overlooked reading his meter and sending a remittance;
- Patronage dividends for the purpose of determining total annual volume and amount of capital credits;
- Automatic compilation of capital credits allocated for each customer by years of allocation;
- A means of computing the amount and writing the check for any portion of the capital credits approved for payment.

The decision to adopt the punched card system was greatly influenced by the fact that present engineering system studies prepared for plant improvement were based on specific periods of time rather than on specific increments of growth. When plan improvements are made on specific dates established by engineering estimates, the plant improvement may be in advance of the time of the actual need or may be considerably after the time when the change was needed. With the punched card system, detailed studies of growth can be made automatically month by month to insure proper timing of plant improvements.

To establish a system for determining trends of load growth not only by substation areas but by phases, sub-feeders from phases and the direction from the substation would have been almost an impossibility with the old accounting system.

Line Loss Considered

Even the matter of line loss was a factor in the decision. In 1954, the co-op experienced a line loss of approximately 14%. In 1959 it had a 9.4% line loss. The engineering department believed that, given exact line loss information by substation areas, a complete study could be made of the areas where line loss was greater than average. The department could then determine whether system overloading or other facility failures might be adding to line loss.

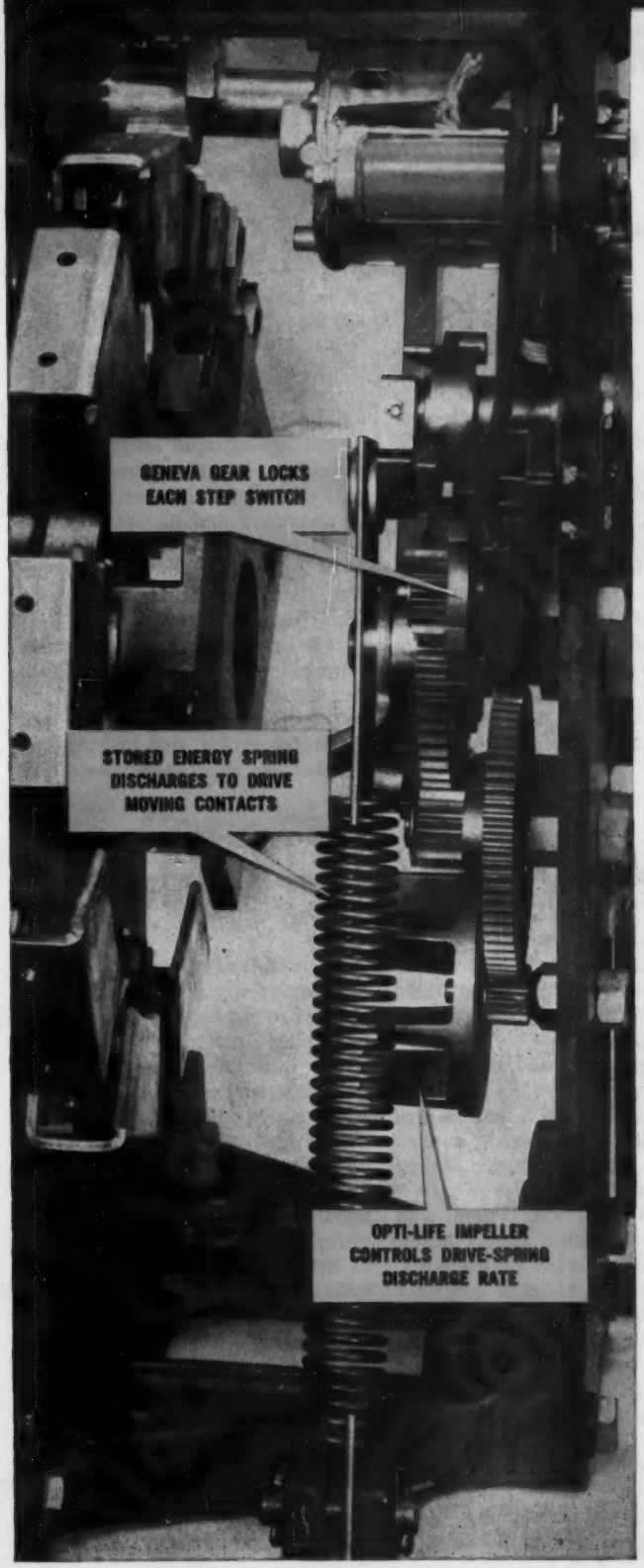
Meanwhile, the accounting department recognized that, on a cost per member basis, its system of each consumer reading his own meter, computing the bill from a rate chart, and forwarding that reading and remittance was extremely inexpensive. But numerous errors required a great deal of correspondence, and often field trips were made to consumers' premises to get correct meter readings or to explain to the consumer the area in which an error occurred.

The department also had to provide delinquent notices manually to accounts who failed to submit a reading and/or remittance.

After extensive studies, the accounting department decided that an automatic punched-card accounting

(*Continued on page* 97)

ANOTHER STEP AHEAD IN VOLTAGE REGULATION


GENEVA GEAR LOCKS EACH STEP SWITCH
STORED ENERGY SPRING DISCHARGES TO DRIVE MOVING CONTACTS
OPTI-LIFE IMPELLER CONTROLS DRIVE-SPRING DISCHARGE RATE

CONTROLLED REGULATOR SWITCHING SPEED

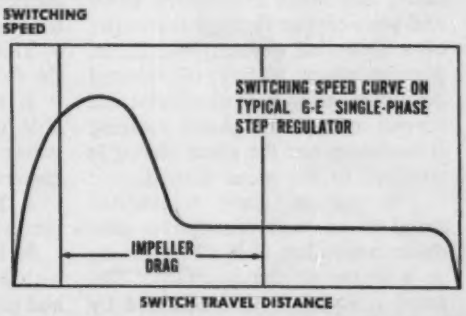
General Electric voltage regulator switches operate 20 years without inspection . . . give you maximum contact life

As regulator users know, there is an optimum tap-changing speed for maximum contact life. Optimum speed must be *controlled* and *non-linear.*

General Electric's exclusive Opti-life switch satisfies these requirements. Results: contacts "break" fast to reduce arcing. Contacts "make" at a calculated rate to (1) reduce mechanical abrasion of contacts, and (2) reduce arcing from contact "bounce."

Truly *controlled* speed of General Electric Opti-life switches is achieved by a fast-action drive, *plus* an oil-immersed impeller which dampens switch velocity as contacts close.

Benefits to you: maximum contact life. In fact, it *isn't necessary to periodically inspect* the interior of a General Electric ML-32 regulator. Under normal operation, switch inspection shouldn't be necessary *for at least 20 years.* You save money!

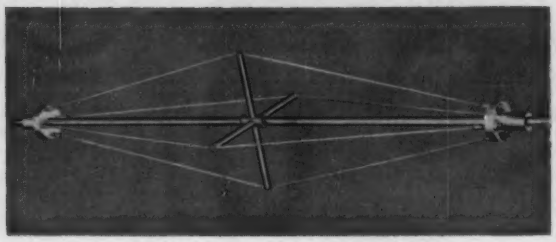

SWITCHING SPEED
SWITCHING SPEED CURVE ON TYPICAL G-E SINGLE-PHASE STEP REGULATOR
IMPELLER DRAG
SWITCH TRAVEL DISTANCE

FOR MORE REASONS WHY G-E regulators cost less on the line—see your General Electric regulator representative. Or, write General Electric Company, Section 456-05, Schenectady 5, N. Y. *Voltage Regulator Product Section, Pittsfield, Mass.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Vibration Suppressor Permits High Tensions



ARTHUR P. GRASSER, Ball Damping Devices, Inc, Cleveland, Ohio

An adjustable vibration suppressor inhibits oscillations of all types that tend to cause flexing, cold-working and subsequent line failure. The device also cuts initial installation costs by fully utilizing a conductor's tensile strength.

The vibration suppressor is composed of two fittings which are rigidly clamped directly on the conductor—a central spreader and a number of cables stretched between the fittings and over the spreader. The end members of the cables project through the fittings and are threaded so they can be tightened like bicycle spokes.

A "vibration trap zone" is thus established as part of the span of wire between its support points. No oscillations in the main wire can be built up or sustained, because vibration and oscillation characteristics form two distinct paths within that span. One path is through the unbroken main power-carrying conductor, and the second is through the cage-like structure surrounding the main conductor and in parallel with it.

With this arrangement, it is possible to change all oscillation periods in the conductor by absorbing them in the suppressor. In addition, the adjustment feature provides that any portion of the stress and strain in the main wire can be varied from 100% to zero within the vibration trap zone.

Because vibration is a function of the stress in the wire, it has been impossible to utilize the greatest strength of the wire. When higher tensions, commensurate with wire ultimate strengths, are used, the probability of rapid fatigue failures increases. At the present time, recommendation for successful use of aluminum and its alloys is that tensions should not exceed 25 to 35% of the ultimate strengths, unless fatigue failures due to vibration are acceptable.

It is anticipated that the vibration suppressor will make it possible to increase conductor tensions to 60 and 70% of ultimate strength and therefore reduce the heights and possibly the number of towers per mile.

Plate Al, Cu Contacts With Powder Welds

The Powder Weld Hot Melt Process, a method of projecting powdered and finely fragmented silver and phos-copper through the center of a shrouded oxyacetylene flame, permits silver plating of selected contact areas on both aluminum and copper components. Little masking is necessary and the silver plating is confined to the areas desired.

The use of finely fragmented metal in an inert atmosphere produces a true hot melt which results in a braze at the interface. The bond is equal to that obtained by electroplating and the electrical characteristics are the same.

The shroud or shield gas, which acts both as the carrier of the metal and the shroud around the projected metal, is nitrogen. This inert gas shields the silver and copper from the atmosphere. It also reduces surface oxides which, if the surface is not shielded during pre-heating and plating, would form a non-metallic barrier between the base metal and the plating.

The apparatus used consists of the following parts:

1. Hand torch, with interchangeable nozzles and separate control valves for fuel gas, oxygen, shield gas and powder feed.

2. Hand torch hose system, with marked and indexed supply hoses.

3. Powder flow control assembly, with carburetor, material container and gas material proportioning unit.

4. Mobile stand, shelf and pan.

5. Fuel gas, oxygen and shroud gas cylinders together with their diaphragm regulators.

Various forms of nozzles, regulators, flow meters, etc., are added to suit conditions.

The piece to be plated is thoroughly degreased, and the area to be plated is grit-blasted with aluminum oxide abrasive. This operation, when masked, defines the area to be plated and removes all surface oxide. In certain applications, sanding discs may be used instead of blasting, but aluminum surfaces should always be blasted. No. 25 abrasive or larger should be used.

With the plating torch set to flame wash the plating area with the nitrogen shroud, the area is heated to between 300F and 400F. Heat indicators keep heating below the annealing temperature of the base. At the same time the flame washing shroud heats the area sufficiently to preclude any water precipitation from the flame. When the temperature of the area is more than 300F but less than 400F, the hot melt silver thumb valve on the torch is opened and the molten silver coats the area to the desired thickness.

NEW!

ENGINEERED INTO BLACKBURN ALL-ALUMINUM 2-BOLT CLAMPS...

ALL WEATHER PROTECTION

On Aluminum or Bi-Metallic Connections

Contact surfaces guarded by rainshield design of castings—inhibitor will not "wash out" even under driving wind and rain.

Condensation is drained off through ports in castings regardless of installation position—never allowed to accumulate around the conductors.

Designed with hot stick crews in mind.

Massive all-aluminum clamp—including hardware—may be used on aluminum or on copper conductors with inhibiting compound. Extra thick, highly conductive aluminum spacer separates dissimilar conductors for added corrosion protection.

Four clamps accommodate a wide range of wire sizes—main from 6 to 795 ACSR, tap from 8 to 397.5 ACSR. Write for samples and literature.

LIVE BETTER ELECTRICALLY

For complete information and test data: Send for Bulletin #6003

Jasper BLACKBURN Corporation

1525 Woodson Road • St. Louis 14, Mo.

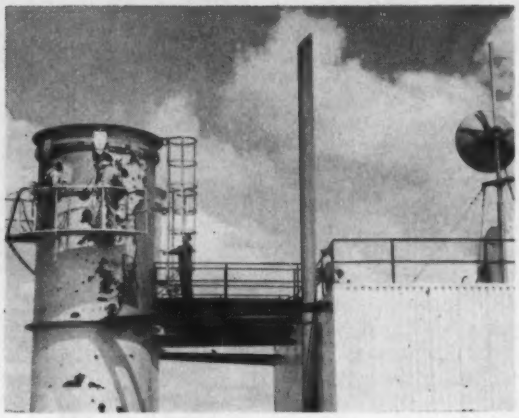
Circular Stage Makes Stack Maintenance Safer

The development and use of circular stages by Southwestern Public Service Co crews have made boiler stack cleaning and repainting safer, faster and more efficient.

The curved platform supplants the boatswain's chair, the use of which was found hazardous and difficult because of the bulk and cumbersome nature of the heavy power cleaning tools and spray equipment necessary for the job.

The stage, constructed of light-weight angle iron covered with a plywood floor, reaches from ¼ to ⅓ the way around the stack. It is equipped with guard rails and other safety devices and provides working space for two or three men. Two geared windlasses are mounted on the stage, thereby allowing up and down travel. The windlass cables are anchored to two rollers riding on a track at the top of the stack, thus permitting "around the stack" motion. Four casters hold the stage away from the stack and allow smooth vertical motion of the stage, free from jumps or bumps.

To prevent the wind from blowing the stage outward, a small cable, threaded through ball bearing assemblies, encircles the stack and is fastened to the stage. The ball bearings act as rollers to allow the cable to follow the stage up and down without binding.



Lamp in Field Circuit Pilots Motor

J. STANLEY BROWN, Chief Engineer, Duquesne Light Co, Pittsburgh, Pa.

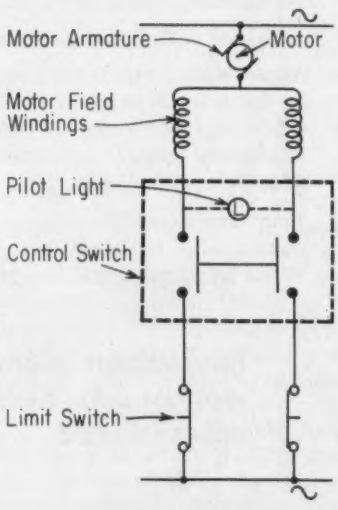
A pilot light which indicates turbine speed-changer motor operation is inserted directly into the motor field control switch circuit to eliminate running any additional wires or grounds, to or from the control switch location.

How is this possible? Analysis of the split-field motor used in the turbine control application shows that the field windings constitute a two-winding, one-to-one ratio, transformer, with windings of opposing polarity. Thus, when current flows through either field winding, an equal but opposite voltage is induced in the other.

The opposing polarity characteristic of the two windings can be used to energize a pilot, or indicating lamp.

A light inserted in the control switch circuit as indicated in the line sketch in broken lines, will be energized when the speed-change motor control buttons are depressed, either to open or close the turbine throttle. However, when the throttle reaches full open or full closed, the limit switches are mechanically opened by the throttle and the light will remain off regardless of whether the control buttons are depressed or not.

Thus, the operator has knowledge of when the turbine throttle is being driven open or closed; also he knows when the throttle has been driven full open or full closed.



SPECIAL METALS

Midwest special fittings can be made from plate or tubing. Greater versatility is therefore possible in the selection of metals: stainless steel, Inconel, monel, hastelloy, aluminum, as well as all other weldable alloys and carbon steels.

MIDWEST SPECIAL FITTINGS MADE BY FITTING SPECIALISTS TO YOUR SPECIAL REQUIREMENTS

SPECIAL SHAPES

Midwest's wide experience and skills with forging presses and dies permit forming plate or tubing into unusual shapes for special applications . . . elbows with or without long tangents, wyes, extrusions, and other special configurations.

For special fittings with any or all of the above characteristics, contact your local Midwest distributor . . . or call:

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1150 S. Second St. • St. Louis 4, Mo. • MAin 1-8300

SPECIAL THICKNESS

Wall thicknesses in a wide range of sizes are available in Midwest special fittings, up to 4" or more in carbon steel and a wide variety of alloys . . . stainless steel, Inconel, titanium, and others.

5946

Imports Rise, Profits Dip in Canada

Canadian electrical manufacturers examine plight of their industry, find only solution is government aid on tariffs and quotas

The increasing problem of foreign competition was the main topic of conversation, both off and on the record, at the Canadian Electrical Manufacturers Assn's 16th annual meeting, held Sept. 28-30 in Niagara Falls, Ont.

"Increased encouragement by government" in the form of moral aid, quotas, tariffs, and other means was the answer outgoing President George L. Wilcox advocated for the present plight of the Canadian electrical manufacturing industry.

That plight he outlined at a press conference:

- A decline in output from the industry's high in 1956 of $1.09 billion to the 1959 level of $1.05 billion.
- A stagnation of the total electrical equipment market since 1956, remaining at a level of $1.5 billion.
- An increase in imports from 26.8% of the total electrical equipment market in 1956 to 29.8% in 1959.
- A drop in the net profit on sales from 3.3% in 1956 to 3.0% in 1959.
- A drop in total employment in the industry from 89,000 in 1956 to 72,000 in 1959.

Wilcox, also president of Canadian Westinghouse Co, Ltd, explained that tariffs or quotas, imposed by the government after it became fully aware of the predicament of the industry, would help solve this problem. When asked what would be the utility and industrial customer response to the higher prices probably resulting from the proposed tariffs, he answered, "There will undoubtedly be resistance to increased tariffs, but I feel that if the government is convinced that tariffs are necessary, then I would expect customers to recognize that this was done in the best interests of Canada."

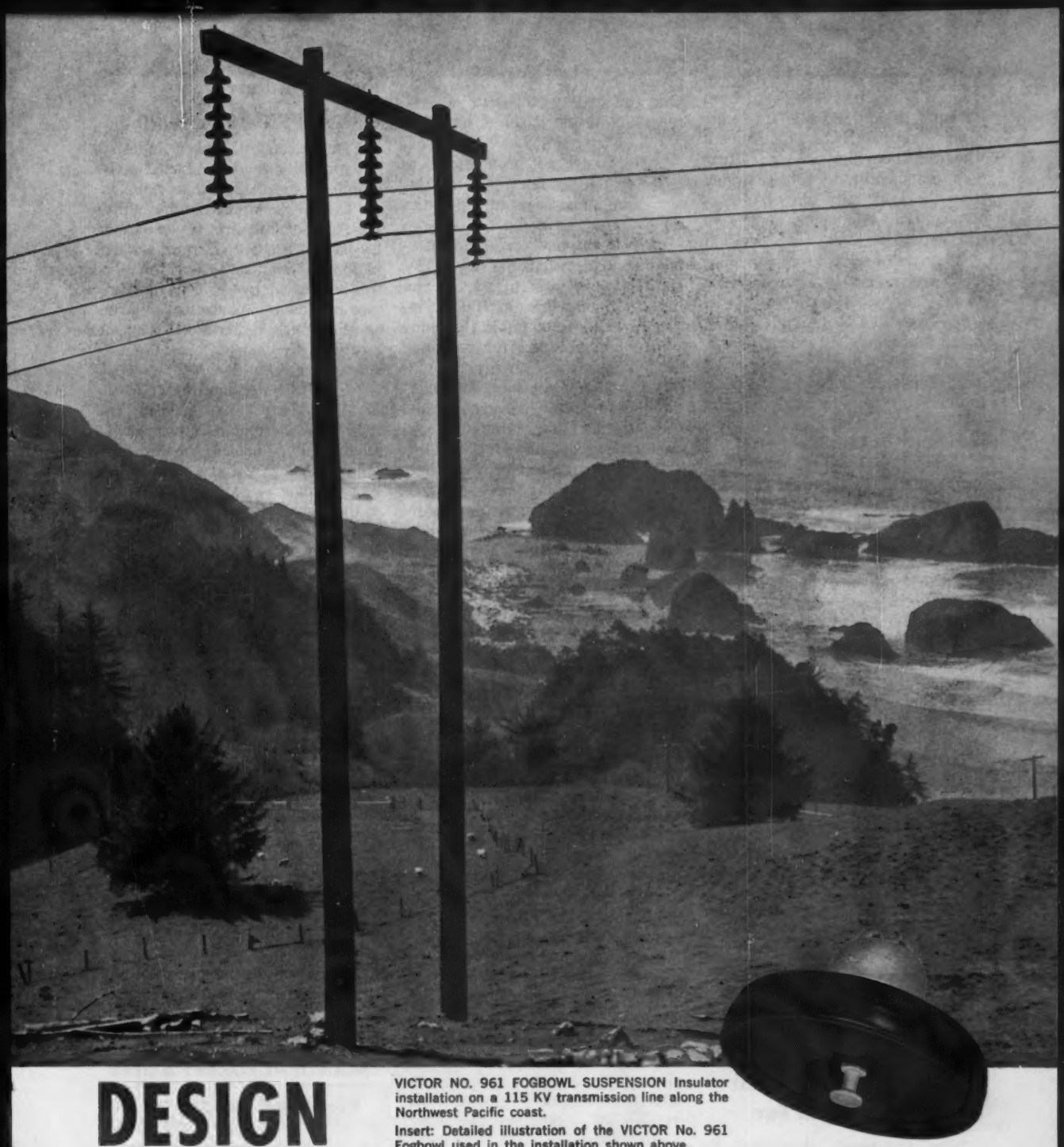
But other than this solicited remark, the talk at the meeting centered solely (and naturally) on the needs of the manufacturers. Canadian manufacturers have, of course, been hit harder than US manufacturers by foreign competition. Partly, this is due to the tariff structure of the country which allows heavy electrical equipment to be imported more cheaply into Canada than into the US. Also, this is due to a long tradition of buying goods from overseas, particularly from the United Kingdom.

To Canadian manufacturers, this situation was all right as long as the market was growing and Canadian wages were low enough to make the products competitive. But with the advent of a buyers' market and increasing wages in Canada, the tables began to turn against the Canadians. Despite extensive cost-cutting programs, including turning more and more to European-type designs, Canadian manufacturers say they have not been able to remain competitive and still realize a profit.

How far the manufacturers will be able to go in their drive for increased government help is another matter. Canadians, in general, traditionally have been free traders because of the heavy dependence of their economy on the exports of their raw materials. But the newly-elected president of CEMA, J. W. Kerr [also president of Triangle Conduit & Cable (Canada) Ltd], feels that headway has been made and that the association has gotten to the point where the ramifications of the problem can be defined and where more definite and systematic approaches can be made to the government in Ottawa.

Another leader in CEMA, President J. H. Smith of Canadian General Electric Co Ltd, said he is in agreement as to the gravity of the problem, and pointed out that a few months ago CGE reversed its long-standing policy of non-commitment toward the issue of free trade vs protectionism and is now supporting the movement for more government action. He said he would like Canadian utilities to take the same attitude as US utilities do, and not

John W. Kerr, new president of CEMA; George L. Wilcox, outgoing president



DESIGN

VICTOR NO. 961 FOGBOWL SUSPENSION Insulator installation on a 115 KV transmission line along the Northwest Pacific coast.

Insert: Detailed illustration of the VICTOR No. 961 Fogbowl used in the installation shown above.

VICTOR has done more constructive research on insulators for contaminated areas than any other manufacturer in the field. Dramatic proof is the creation of the already famous No. 961 Suspension shown above.

Here is an entirely new concept in fogbowl insulator design . . . a totally different but effective answer to the problem of insulating in areas suffering from the contaminating effects of salt-laden air, fog, smog, dust, chemical or industrial fumes.

VICTOR No. 961 fogbowl suspensions were selected for this installation after exhaustive field tests conducted over a period of years on many makes of both conventional and fogtype insulators. The customer reports perfect service after years on the line . . . **with no expensive insulator washing.** Look to VICTOR when you have a contamination problem. For catalog, specifications and prices, contact your nearby VICTOR Sales Office. Victor Insulators Division, I-T-E Circuit Breaker Company, Victor, N. Y.

I-T-E CIRCUIT BREAKER COMPANY

consider price alone in buying.

CEMA members also heard from National Electrical Manufacturers Assn's President N. J. MacDonald, who told them that US and Canadian manufacturers were suffering from the same problem of foreign competition. "Sooner or later, we will have to make the decision whether we're going to manufacture for ourselves or let somebody else do it," he emphasized.

He mentioned a film NEMA board members had recently seen on the production facilities of a large Japanese electrical manufacturer, Toshiba. He said the film indicated that the Japanese firm's production facilities were every bit as good, if not better, than those found in the US and their products excellent. "It scared the hell out of a lot of members of NEMA."

Other talk at the meeting centered around the current economic situation. Privately and publicly, the Canadian members expressed the opinion that the US economic outlook was not as bright for the next year as presently pictured. They felt that Canada was already in a recession and that the US would soon follow, if indeed it hadn't done so already.

As a result of the bearish outlook the Marketing Research Committee of CEMA's Major Appliance Division made the forecast that 1961 "is not going to be much better than 1960" for the Canadian appliance industry. "Beyond 1961 we can look for a fractional increase each year but no sudden upsurge before 1964 or 1965."

Some members at the presentation said the forecast for next year was "too optimistic."

Seven Utilities Benefited By Project EHV So Far

New techniques developed by Project EHV research already have proved useful to seven utilities, reports General Electric Co. At minimum cost, line outages and radio noise are being reduced.

Transmission lines can now be built for best performance consistent with lowest investment, says Dr. Pier A. Abetti, manager of the project for GE. He explained that overconservatism (over design) adds appreciably to the cost of EHV lines. One US utility reported a 1% reduction in the cost of its EHV line at a saving of $1,800 per mile.

Studies have not been limited to 345 and 460-kv lines. GE has investigated three cases of difficulties on 230 and 138-kv lines.

Among the new tools and information made available for EHV studies are models of towers and lines, lightning shielding failure indicators, and Teinographs (lightning waveshape recorders for mounting atop transmission towers). Computer programs are used for determining radio noise, corona loss, and over-all evaluation of optimum conductor size, configuration, bundling, and performance of a proposed line.

Problem causing the most concern is radio influence. Studies relating to prediction or reduction of radio influence levels have been made most frequently. Through the computer program developed through extensive laboratory work and mathematical analysis at GE, suggested modifications for any commercial line can be made.

For corona loss, programmed for computer analysis either on existing or proposed lines, GE can suggest, in most studies, alternative ways to improve performance. Utilities choose which, if any, suggestions will be used.

Other studies frequently made determine how lightning response and insulation design will affect line outages. Such new tools as the Teinograph and lightning shielding failure indicators (recording direction of insulator flashover by means of Lichtenberg figures) have been developed. Laboratory tools include geometric models of towers and lines, plus a new computer program. These provide line response for a given design and then determine the effect of changes in ground wires, number of insulators, and tower footing resistance.

Dr Abetti believes EHV lines are commercially feasible for coal-by-wire use, eliminating right-of-way bottlenecks and moving bulk power from large, remote generating stations to load centers. "At least eight utilities," he says, "are presently actively studying 460-kv transmission." Several 650 to 750-kv lines will be in operation by 1980, he predicts.

Industry's Research Sets Pattern for Nation

"The electrical power industry has for many years conducted a research program second to none in the nation. As a result of this effort, the American electric power industry has set a growth pattern for the nation to emulate." This opinion was expressed by A. C. Monteith, vice president—apparatus products, Westinghouse Electric Corp, at a meeting of Pennsylvania Electric Assn recently.

Monteith stated that the US electrical industry's unparalleled research and development program is one of the key reasons the electrical industry has grown at a rate far exceeding that of any other industry in this country—and the reason the US will continue to outstrip Russia in its drive for technological world supremacy.

Our economy has been growing at a rate of 3½ to 4% annually since World War II, he pointed out, while Russian economy is calculated to be growing at an annual rate of 7%. However, the US electrical industry has increased by 150% its generating capacity in the past 10 years, producing three times as much power as the Russians. In the next decade, our electrical industry will add enough generating capacity to power another United States, Monteith predicted.

Present techniques are such that, should demand warrant, "we are prepared to build cross-compound generating units of one-million-kw capacity. This is more than double the rating of the largest such unit shipped by the electrical industry."

MANUFACTURERS BRIEFS

Rea Magnet Wire Co, Inc, subsidiary of Aluminum Co of America, will build a research laboratory in Fort Wayne, Ind., by 1961.

Exide Industrial Division, Electric Storage Battery Co, has boosted capacity of batteries for stationary uses by 66% "and more." A tubular-type plate has been incorporated in a new battery called the EHGS Exide-Ironclad. This, says Exide, far surpasses capacities of other batteries used by electric utilities.

PROTECT YOUR SYSTEM AND EQUIPMENT WITH CHANCE PRECISION-MADE FUSE LINKS...

EEI-NEMA K or T links in all three designs:

1. OPEN LINK
2. UNIVERSAL BUTTONHEAD
3. UNIVERSAL WITH REMOVABLE BUTTONHEAD

A lot of expensive equipment on your system owes its life to the reliability of a fuse link. Make sure that equipment is protected positively, safely, with fuse links precision-manufactured to EEI-NEMA Interchangeability Standards. Chance K and T fuse links are held to uniformly precise tolerances by an automatically controlled manufacturing process. Their proper coordination is assured, and pre-testing before shipment guarantees their accurate performance.

Chance K (fast) or T (slow) links are available from 1 to 200 amps with Universal Buttonheads, or as Universals with removable buttonheads and cable adapters, and from 1 to 50 amps in Open-Link style. They have extra-high strength, two-ply protecting tubes with an arc-quenching inner layer and a weatherproof outer layer. Cables are lead-coated for maximum resistance to corrosion.

FOR FULL OVERLOAD CAPACITY TRANSFORMER PROTECTION USE CHANCE SLOFAST FUSE LINKS

Chance SloFast dual-element Fuse Links follow the ASA safe loading curve for transformers. They permit full use of transformer overload capacity . . . reduce outages as much as 30%, and completely protect transformers from damaging secondary faults. Available in open-link and both buttonhead types from 0.2 to 46 amps inclusive.

A. B. CHANCE CO.
CENTRALIA, MISSOURI
(A. B. Chance Company of Canada, Ltd., Toronto)

CHANCE FUSE LINKS . . . PRECISION-MADE FOR EVERY ELECTRICAL AND MECHANICAL APPLICATION

CF60-33

New Equipment

Watthour Meter Test Unit . . .

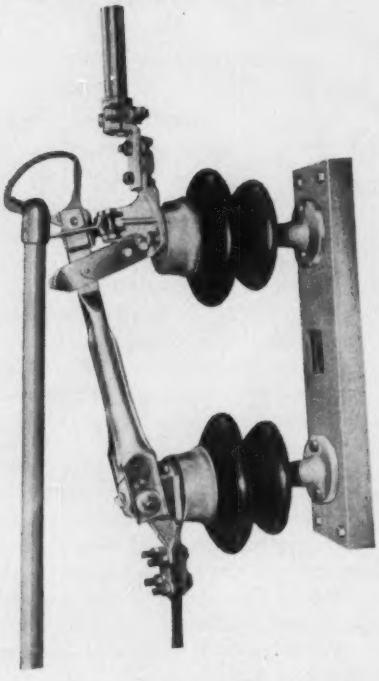
. . . for two and three-wire meters provides the means for keeping these watthour meters within 0.10% accuracy. The transistorized electronic unit, which will be tailored to meet individual needs, is of modular construction to aid inspection and maintenance. The 56-sec test cycle is completed automatically, so the operator needs only to place a meter in the test socket and press a start button. A stop button is provided for interrupting the test.

General Electric Co, Schenectady 5, N. Y.

Hookstick Switch . .

. . . provides a 10-deg angle between the blade and the vertical when it is closed. This permits the operator to stand close to the structure. The shape of the hook ring seats the hookstick at a point of greatest mechanical advantage. The type "B-2L" outdoor disconnect is furnished for 7.2 to 69 kv, 600 and 1,200 amp. Double-throw and tandem-throw switches are also available.

Delta-Star Electric Div, H. K. Porter Co, Inc, 2437 Fulton St, Chicago 12, Ill.



Suspension Insulator . .

. . . rated at 15,000 lb is for areas where severe contamination makes insulator washing necessary. Triple petticoat of the "California" fog-type suspension insulator provides 18 in. of leakage distance. The deep corrugations swirl the wash water around the insulator to clean its entire surface.

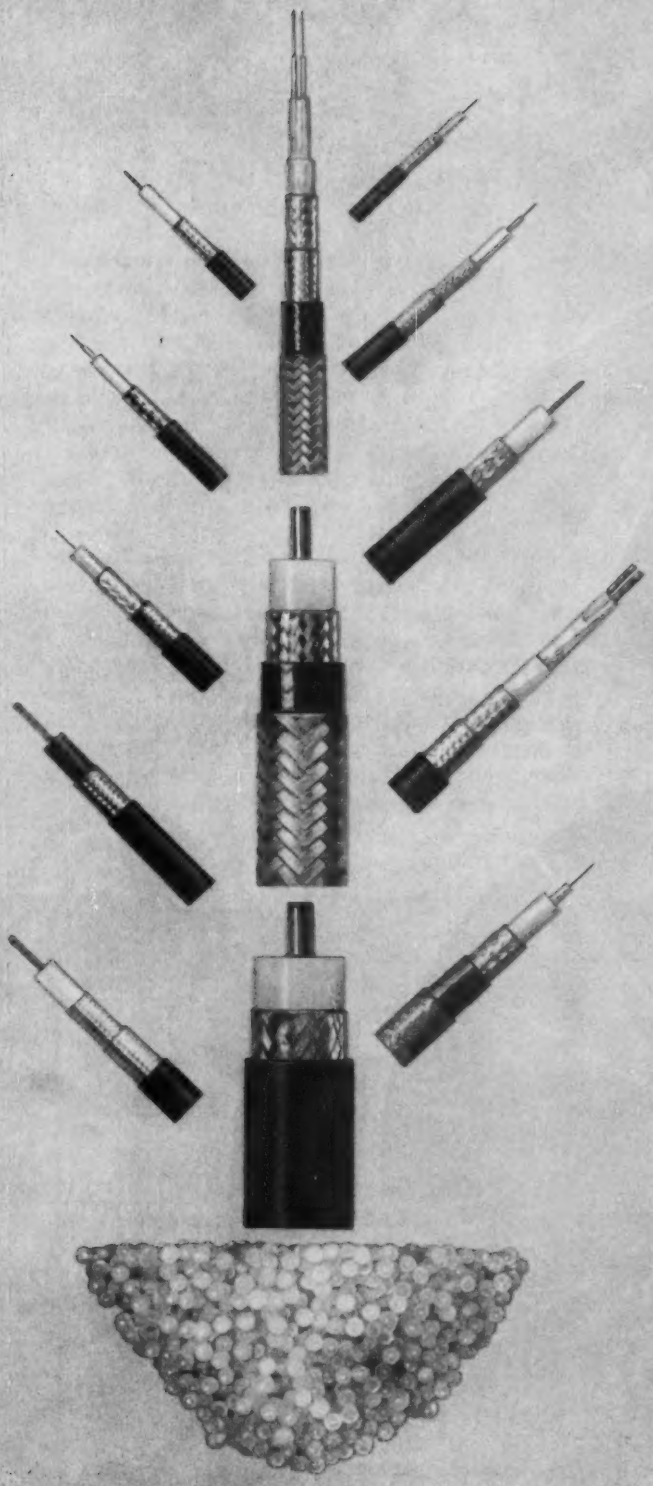
Lapp Insulator Co, Inc, Le Roy, N. Y.

Recording System . . .

. . . with eight channels records either electrically or with ink. Preamplifier for each channel can be for ac, dc, carrier or servo input. Driver amplifiers are transistorized. Full deflection on the direct writing rectilinear recording system is 20 mm, which is proportional to 2 v or 2 mv, depending upon the preamplifier selected. Chart speed is variable.

MASSA Div, Cohu Electronics, Inc, 5 Fottler Rd, Hingham, Mass.

(*More New Equipment on page* 74)



TENITE POLYETHYLENE

...found in the first families of coaxial cables

AMPHENOL has been a pioneer in radio frequency cables since 1936, and offers one of the most complete lines of R-F coaxials in the world. Amphenol cables are characterized by top performance electrically and physically, and Tenite Polyethylene plays an important role in this performance both as a dielectric and as a jacketing material.

As a dielectric, Tenite Polyethylene gives flexibility, high dielectric strength, low dielectric constant—at low cost. For an even lower dielectric constant, it can be expanded with gas into a cellular or "foamed" material.

As a jacketing material, tough Tenite Polyethylene provides excellent resistance to abrasion, weathering, moisture and heat. Users can look forward to years of maximum protection. Its easy handling and stripping qualities make it a favorite with linemen.

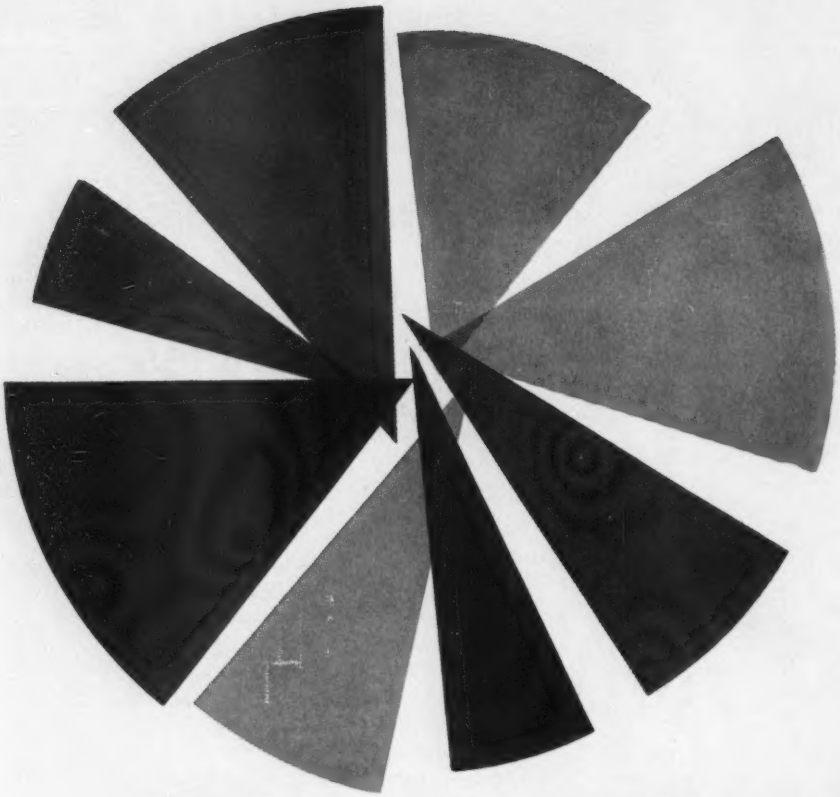
Tenite Polyethylene is easily extruded as jacketing or insulation for many diverse wire and cable applications. For more information on the outstanding electrical and physical properties of this versatile Eastman plastic, write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE®

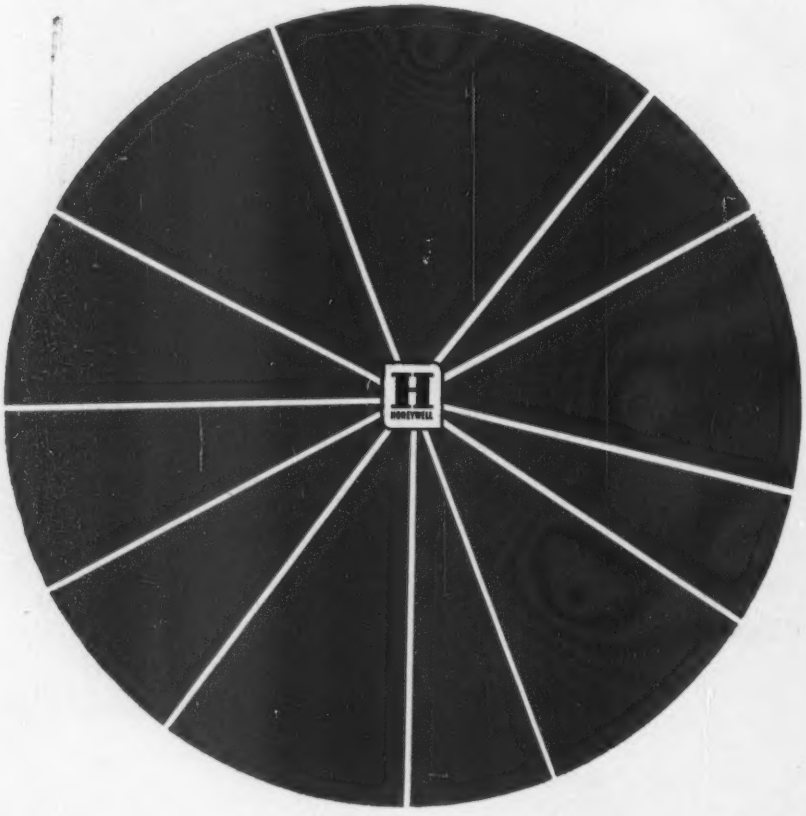
POLYETHYLENE

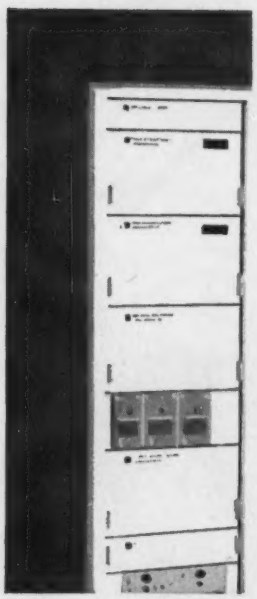
an Eastman plastic

- *Cable manufactured by Amphenol Cable & Wire Division, Amphenol-Borg Electronics Corporation, Chicago, Illinois.*
- *Both natural and black electrical grade Tenite Polyethylene are available to cable manufacturers in a unique spherical pellet form which flows freely in the extrusion process and in "air-veying" of bulk shipments from truck to bin.*



YOUR CONTROL SYSTEM—HYBRID OR HONEYWELL?





The answer can be important to you. True, you can combine several makes of instruments into a system and get adequate results. But you usually pay a penalty for hybrid systems. There's the burden of responsibility for engineering and maintaining the system. There's the question of whether it will do what you want it to. There's the problem of modifying various makes of components to work together. And there's the inconvenience of buying instruments and spare parts from several suppliers instead of one.

Single-Source Responsibility. You avoid all of this with an all-Honeywell data processing or automatic control system. All components, from primary measuring elements to final controls, are supplied by Honeywell. If your requirements call for an analog or digital computer, Honeywell can supply it. From our systems engineers you get the advantage of experience gathered over 75 years of measurement and control work in scientific, military and industrial operations. And Honeywell takes full responsibility for the system, from initial planning through installation and startup, and even including maintenance.

Conserve Your Working Capital. You can conserve working capital by leasing a Honeywell system from one to five years, paying for it as you use it. Because you lease at today's prices, you're protected against possible future price increases. Because you deal *only* with Honeywell, you needn't worry about long negotiations with third parties.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pennsylvania. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

75th YEAR PIONEERING THE FUTURE

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First in Control

SINCE 1885

New Tunable Voltmeter is also flat AC VTVM covering 1 to 600 KC

Sierra 125A
Frequency Selective Voltmeter

As a frequency selective voltmeter, Sierra 125A covers 3 to 600 KC continuously on a 40" scale. An up-converter with high IF and single conversion keeps spurious responses down 60 db. Crystal lattices provide two steep-skirted IF bandwidths — 250 cps or 2.5 KC.

As an AC VTVM, Model 125A offers response flat within ± 0.2 db, 1 KC to 600 KC, and measurement accuracy of better than ± 0.5 db. This additional mode increases the instrument's versatility and facilitates measurements on carrier systems.

Measurement range is —90 to +32 dbm in selective mode and —30 to +32 dbm in the flat mode. Signal levels are read directly on either 135 or 600 ohm lines, balanced or unbalanced. Line bridging loss is less than 0.25 db over the entire frequency range. Built-in 100 KC crystal oscillator provides accurate reference for both level and frequency calibration. Modular construction and etched epoxy glass circuit boards provide ease of access and operating dependability.

Price, $895.00 f.o.b. factory.

For complete details, see your Sierra representative or write direct.

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Compression Connector . . .

. . . for a tee tap calls for only one die for compressing both main and tap. The DCT connector has a wide

separation of the tap and main for maximum protection in making bimetallic joints. The main is open at the side for hot-line work.
Anderson Electric Corp, Birmingham, Ala.

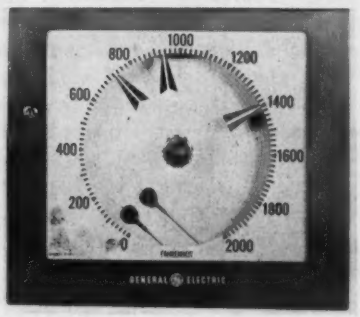


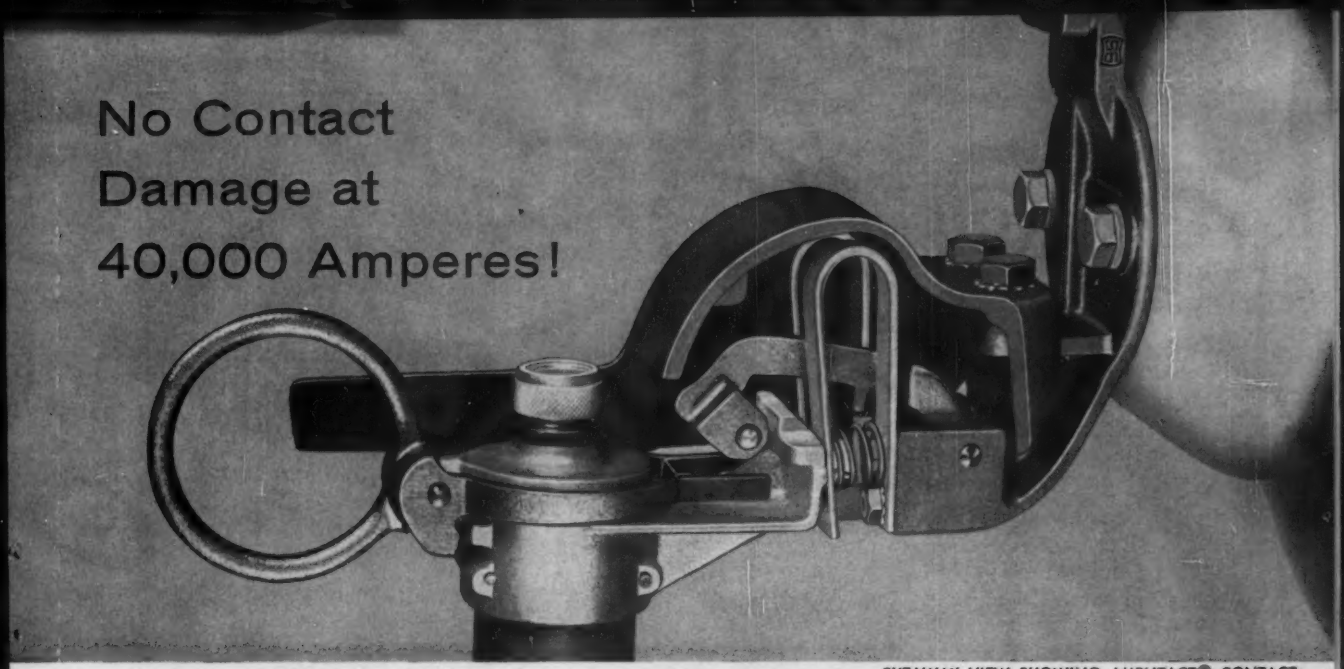
Chart Recorder . . .

. . . for recording two variables is accurate to within 0.25%. The two-pen potentiometric round-chart recorder-controller's scale length is 27.5 in. Available chart speeds are 1 hr to 7 days; pen speeds are 4, 10 and 24 sec full scale. Zener diodes provide a constant, accurate voltage reference.
General Electric Co, Schenectady 5, N. Y.

Power Take-Off . . .

. . . transmits full engine power to operate accessory equipment, such as a derrick or digger. The model TML is especially for vehicles with short wheel bases. The short gear case provides good ground clearance

(*Continued on page* 76)



CUTAWAY VIEW SHOWING AMPLITACT® CONTACT

SOUTHERN STATES' POWER FUSES EMPLOY AMPLITACT® CONTACTS TO PREVENT CONTACT DAMAGE

Now, for the first time, "switch-proved" Amplitact® contacts are used on Southern States power fuses. Repeated tests at current ratings up to 40,000 amperes show no contact damage.

Used successfully for many years on Southern States air switches, Amplitact® contacts are now used on the new BPA and HPA Power Fuses.

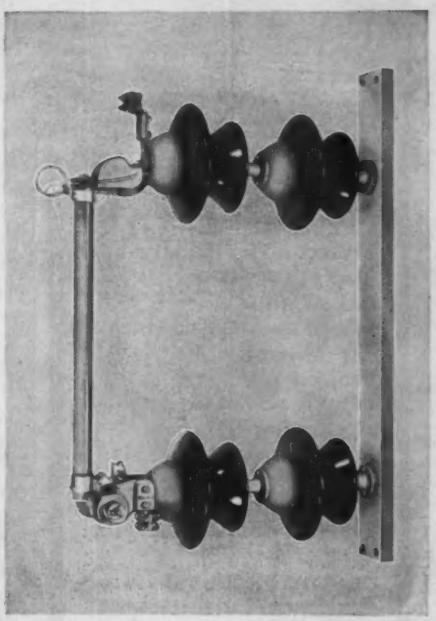
The Amplitact® harnesses electromagnetic forces generated on a high fault, increasing contact pressure when it is needed most.

While contact damage under extremely high fault currents has been more irksome than serious, the Amplitact® eliminates any possibility of damage.

These new power fuses have all of the outstanding advancements of the BP, MP, and HP power fuses introduced by Southern States in 1959—plus the reverse-loop contact. They have expendable cap fuse holders to provide dependable clearance of high or low current faults. Fuse holders are designed for easier handling and are equipped with a large operating eye. A stationary sleet shield gives better protection against icing and provides guidance when the fuse is slammed closed.

Low cost refusing in the field is accomplished with easy-to-use fuse kits.

Get your Southern States representative to give you full information about this important development in power fuses, or write direct for Bulletin 60 PF.



TYPE HPA POWER FUSE

KREP PACE ELECTRICALLY

IN CANADA
Dominion Cutout Co., Ltd., Toronto

SS

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

*Trademark

"Superforms* handle well" ...say CONSTRUCTION and MAINTENANCE ENGINEERS

"Superforms require no tools for regular use . . . they are readily adaptable for hot-line tools . . . they give us uniformity of application and result . . . they *handle well!*"

Construction and Maintenance Engineers . . . the men responsible for *getting things done Fast, Right and at Low Cost* . . . are making more and more use of Fanner Superforms, everywhere!

A-1589A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS... Protect long-span T&D lines at supports

LINEGUARDS... Protect short-span T&D lines at supports

PATCH RODS... Repair damaged conductors

TAP ARMOR... Protects conductor at tapping points

FANNGRIPS... For dead-ending strands and conductors

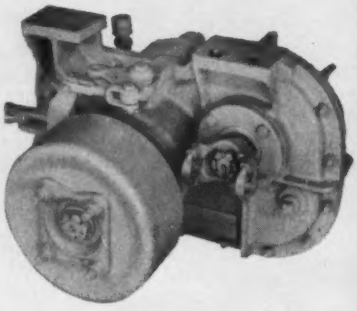
FANNSPLICES... Join two ends of conductor wire

PLASTIC PRODUCTS... For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

Power Take-Off

(*Continued from page* 74)



for trucks that operate off roads. Electro-Matic shift enables control from the cab.
Waterous Co, 80 E Fillmore Ave, St. Paul 7, Minn.

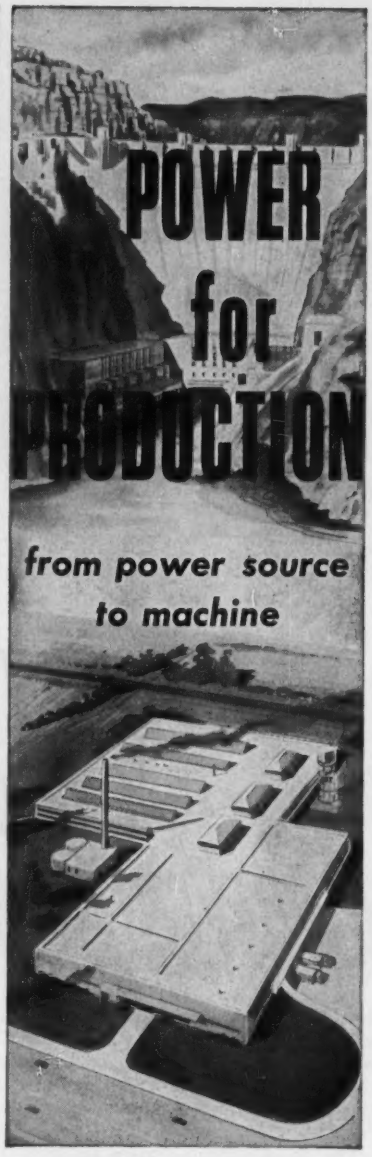
Volt-Ammeter . . .

. . . measures ac and dc within 0.05%, close enough for laboratory calibration. The model C Hermach-Engelhard meter maintains this accuracy from 5 to 50,000 cps. Voltage range of measurement is 0.5 to 1,500 v and the current range, 7.5 milliamp to 25 amp. Its null galvanometer movement minimizes error.
Engelhard Industries, Inc, 113 Astor St, Newark 2, N. J.

More New Products

Silver-cadmium oxide contacts and thermal overload relay with trip indicator are featured by a **magnetic motor starter.** All components, including plug-in push buttons or selector switches, are removable from the front. Ratings are to 30 hp, 550 v ac; sizes are 2 and 2½.—Furnas Electric Co, 1026 McKee St, Batavia, Ill.

Pneumatic bellows **flow meter** measures either flow or liquid level. The transmitting meter is available with or without an indicator. Modular construction simplifies maintenance. Span and zero shifts are kept to 0.5% per 50F change of the ambient.—Brown Instruments Div, Minneapolis-Honeywell Regulator Co, Wayne and Windrim Ave, Philadelphia 44, Pa.

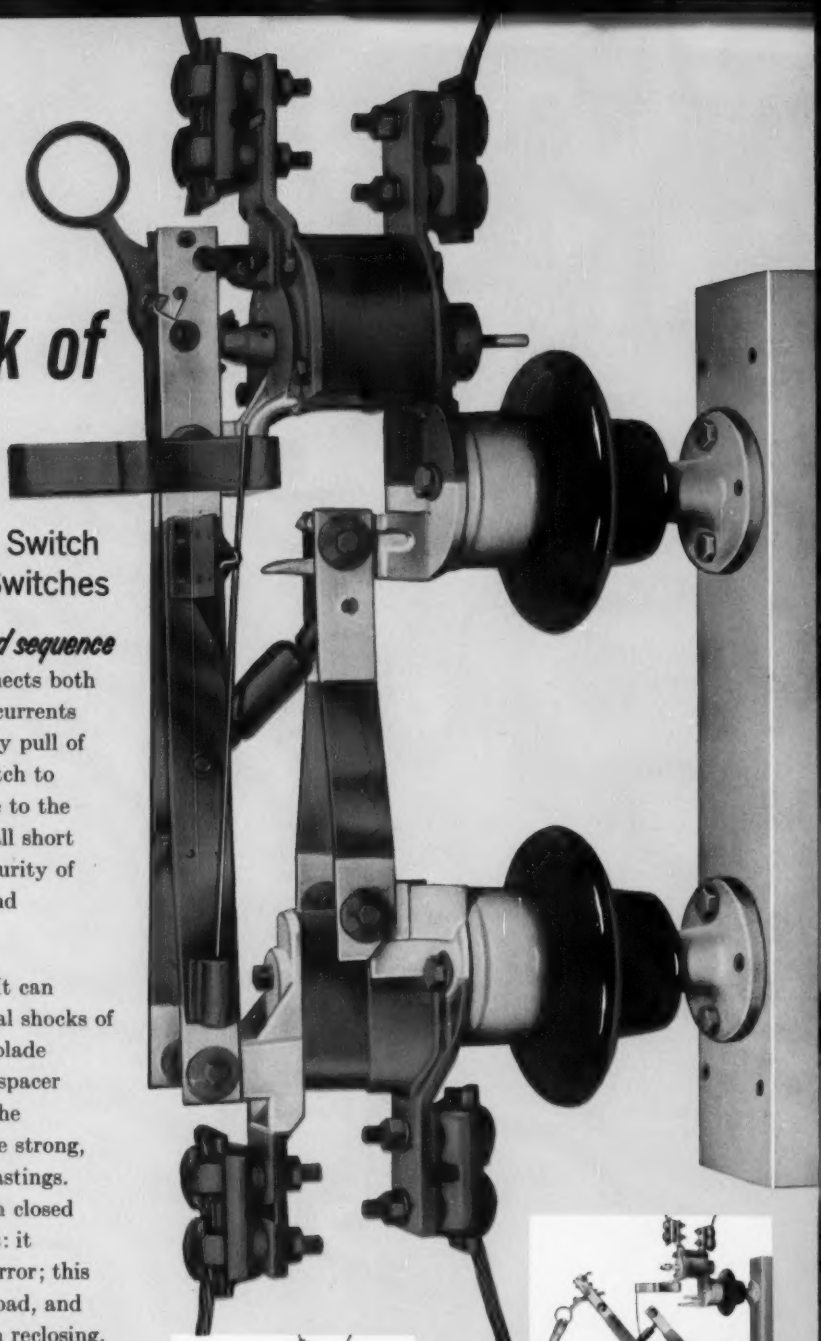


HOOSIER IS THERE!

Quality . . . all along the line . . . has been a Hoosier tradition for over 40 years. Take advantage of Hoosier's "*complete circle*" service for all phases of your transmission, distribution or power plant needs.

HOOSIER ENGINEERING CO.
1350 HOLLY AVE • COLUMBUS 8, OHIO

This one does the work of three



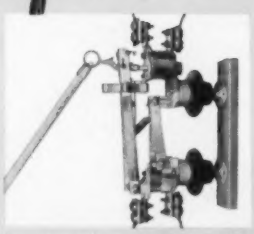
Chance Regulator By-Pass Switch does the work of 3 SPST Switches

and does it in automatically controlled sequence

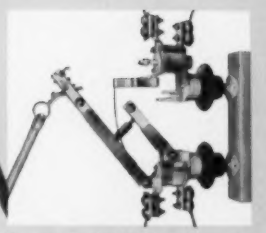
1) by-passes the regulator, 2) disconnects both leads, and 3) interrupts the exciting currents when it's activated by a single, steady pull of a hookstick. We've designed this switch to meet *all* NEMA standards applicable to the SPST hookstick switches, including all short time current ratings. You get the security of *full* NEMA ratings, plus simplified and completely controlled operation.

You can see—this switch is rugged! It can withstand the mechanical and thermal shocks of high current surges. The blade-over-blade design eliminates eccentric forces on spacer insulators. Studs are cemented into the insulators with epoxy resin to provide strong, shock-resistant attachments to the castings. Contact engagement is secure in both closed and by-passed position. Another plus: it eliminates the possibility of human error; this disconnect cannot be opened under load, and the recloser can't be left by-passed in reclosing.

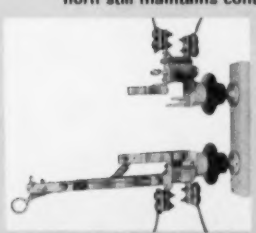
To wrap it up: this Regulator By-Pass Switch is more economical, easier to install, more reliable, less hazardous, and requires less space than a comparable installation of single-throw disconnects. It can be used with all regulators that can be set in neutral for switching. And, it's available in both 400 and 600 amp ratings, from 7.5 to 23 KV. Wouldn't you like complete information? Your Chance Man has it, or write us for Bulletin 280.



1. A pull on the ring disengages the blade latch . . . pulls the shunt bar into by-pass position between the shunt contacts (housed in the upper spacer insulator).



2. With the regulator by-passed, the dual blade continues downward travel, opening both disconnects. Arcing horn still maintains contact.



3. As the blade moves to full open position, snap-out arcing horn whips open to interrupt the exciting current. In reclosing, sequence is reversed.

A. B. CHANCE COMPANY

CENTRALIA, MISSOURI

(A. B. Chance Company of Canada, Ltd., Toronto)

HOW DO WE EASE THE RIGHT-OF-WAY SITUATION?

HOW CAN WE CUT INSTALLED COSTS?

HOW CAN WE SIMPLIFY SWITCH INSTALLATIONS?

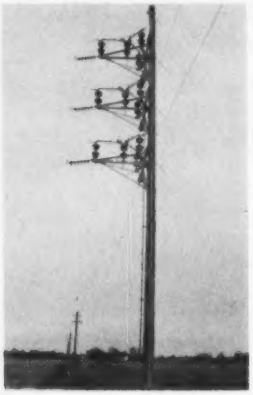
HOW CAN WE SAVE ON MATERIAL COSTS?

HOW CAN WE GET
GREATER OPERATING CONVENIENCE?

HOW CAN WE SATISFY PUBLIC DEMAND
FOR BETTER APPEARANCE?

DO THOUGHTS LIKE THESE GIVE YOU INSOMNIA?

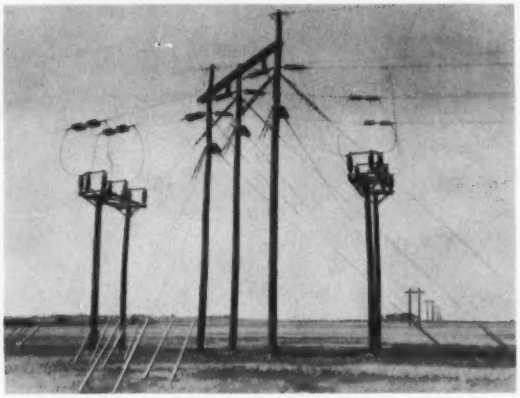
CHANCE ALUMINUM FRAME GOABS give you...



THIS

VERSUS

THIS



THE CHANCE GOABS IS NOW AVAILABLE IN A COMPLETE RANGE OF VOLTAGE AND CURRENT RATINGS TO MEET EVERY NORMAL REQUIREMENT: 2-Way & 3-Way, 400-600-1200 Amp ratings, 7.5 to 69 KV; 1-Way, 600-1200 Amp ratings, 34.5 to 69 KV.

1. **GREATER OPERATING CONVENIENCE** because control of switching is at *one* location. Traveling from switch to switch is eliminated. A "plus" anytime, one-spot switching is a real boon in bad weather.

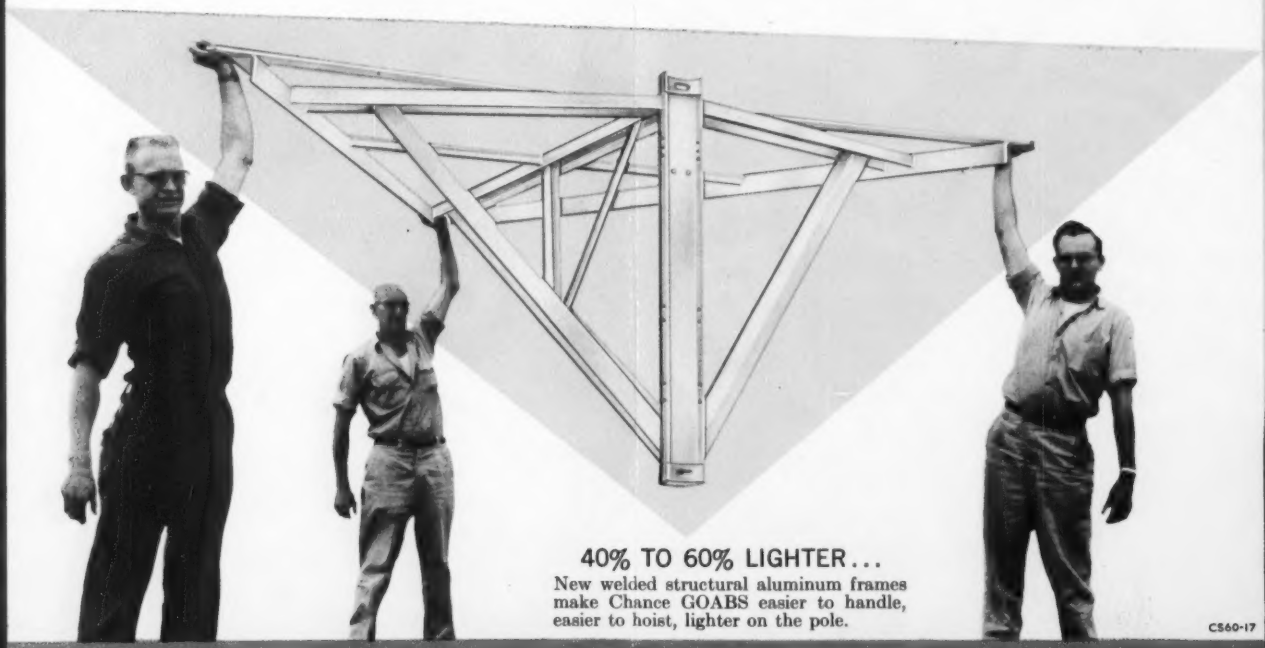
2. **IMPROVED LINE APPEARANCE** because the Chance GOABS requires fewer equipment-carrying poles. Switch installations are clean and uncluttered. Your community relations are strengthened.

3. **MINIMUM RIGHT-OF-WAY REQUIREMENTS** because only one pole is needed to mount an entire unit for either single switches or 2-way and 3-way tap switching. You get phase-above-phase mounting on a single pole. No special structure is required.

4. **REDUCED LABOR & MATERIAL COSTS** because the GOABS welded, one-piece frame requires no assembly in the field, and the GOABS design has no superfluous insulators—only 3 stacks per phase for 2-way switching, 4 stacks per phase for 3-way switching. Handling is easier and quicker; installation is simpler.

5. **SIMPLIFIED MULTIPLE SWITCH INSTALLATION** because only *one* location, only *one* pole, is required. Switches and frame for each phase are handled as a package. Balanced construction of lightweight aluminum frames aids hoisting up the pole.

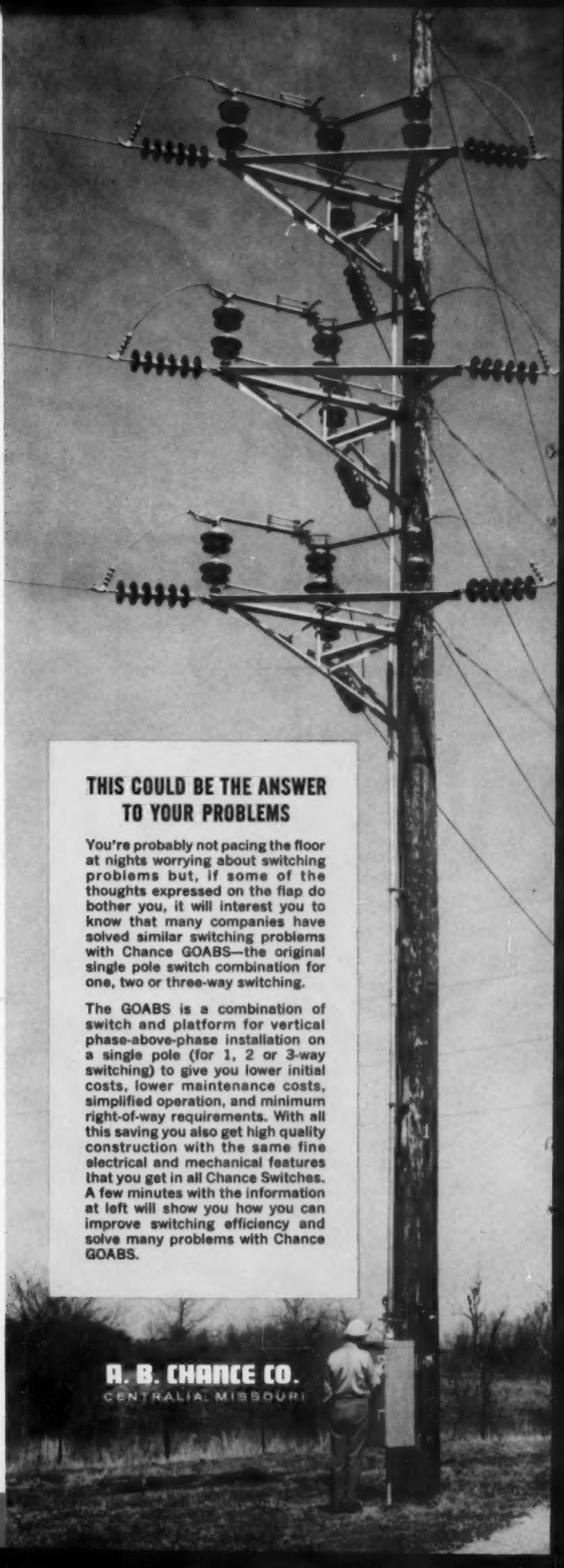
6. **ELECTRICAL AND MECHANICAL RELIABILITY** because Chance GOABS meets all applicable AIEE and NEMA Standards. GOABS incorporate these electrical features: high-pressure, in-line contacts; braidless, non-parting hinge contacts; high-speed arcing horns. Mechanical features include maintenance-free bearings; use of bearings in control pin connections; a clean, rugged design that assures trouble-free operation.



40% TO 60% LIGHTER...

New welded structural aluminum frames make Chance GOABS easier to handle, easier to hoist, lighter on the pole.

C560-17



THIS COULD BE THE ANSWER TO YOUR PROBLEMS

You're probably not pacing the floor at nights worrying about switching problems but, if some of the thoughts expressed on the flap do bother you, it will interest you to know that many companies have solved similar switching problems with Chance GOABS—the original single pole switch combination for one, two or three-way switching.

The GOABS is a combination of switch and platform for vertical phase-above-phase installation on a single pole (for 1, 2 or 3-way switching) to give you lower initial costs, lower maintenance costs, simplified operation, and minimum right-of-way requirements. With all this saving you also get high quality construction with the same fine electrical and mechanical features that you get in all Chance Switches. A few minutes with the information at left will show you how you can improve switching efficiency and solve many problems with Chance GOABS.

A. B. CHANCE CO.
CENTRALIA, MISSOURI

CS60-17

Electrical World

OCTOBER 10, 1960

Management Newsletter

How Utility Commons Fared in the Fifties—II

When utility common prices thrust upward for a 113% climb in the Fifties, higher prices-earnings ratios (PER) supplied much of the energy for the climb. So, of course, did improved earnings per share (EPS). Better earnings, in fact, may be regarded as the catalyst that got things going. For, technically, the rate of increase of earnings largely determines the height to which price-earnings ratio will climb. Thus, these two elements of market price are closely related. Part I of this series dealt with the path PER's traced in the Fifties. This week, Part II takes up the record of earnings per share—the second, and final, element of market price.

While price-earnings ratio is largely a measure of investor confidence, earnings per share is largely a measure of company performance. Since confidence depends on performance, rapidly increasing earnings will also show up as a higher price-earnings ratio on the market. A price-earnings ratio, of course, is vastly more complex than earnings per share for a company. Most of what contributes to a good earnings record can be seen in a company's history, management, and policies. But a price-earnings ratio, in addition, involves value judgments by investors, such as the probable course of inflation and the impact of personal income tax laws.

Management capability, of course, is an all-important factor in increasing per share earnings. Management's efficiency, its aggressiveness in attracting and developing new revenues, in area development programs, in financial ingenuity, in far-sighted planning, and overall economy in operations and construction can all improve earnings. On the other hand, management is also restricted by its environment—notably, by the company's location, which may or may not be favorable. Good fortune goes far toward putting a utility's earnings on top of the heap. Utilities in the phenomenal growth regions, such as the South and Southwest, have made, and will continue to make, a somewhat better showing than most other companies.

But managers of utilities in less favored areas need not feel frustrated because they cannot produce equally sensational results. Many companies operating in the more static regions are doing as good a job, or even a better job, with the material they have to work with than the companies located where industry and population are growing most rapidly.

Considerable Earnings Growth in the Fifties

Per share earnings grew rapidly, and almost uniformly, during the Fifties. But much more so for some companies than for others. In fact, 13 utilities more than doubled their per share earnings during the decade. This remarkable performance is indicated in the table on the next page. All earnings have been adjusted to reflect stock splits during the decade.

These Were Standouts in Earnings Growth in Fifties

COMPANY	PER SHARE EARNINGS 1949	1959	10-YEAR INCREASE	REGIONAL LOCATION
Florida Power & Light	$0.54	$1.98	265%	South
Texas Utilities	1.09	2.95	166	Southwest
Orange & Rockland Utilities	0.61	1.56	156	East
Michigan Gas & Electric	2.33	5.67	143	Midwest
Sierra Pacific Power	1.02	2.38	132	West
Houston Lighting & Power	1.36	3.05	122	Southwest
Florida Power	0.52	1.14	117	South
Central Hudson Gas & Electric	0.65	1.41	117	East
Missouri Public Service	0.49	1.03	117	Midwest
Cleveland Electric	1.38	2.95	113	Midwest
El Paso Electric	0.84	1.69	102	Southwest
Public Service of New Mexico	0.75	1.51	101	Southwest
Central & Southwest	0.66	1.33	100	Southwest

Eighteen more companies managed to increase their per share earnings by from 67% to 100%. These companies are shown in the table on the opposite page. Again, per share earnings have been adjusted to reflect stock splits that occurred during the Fifties.

To simplify the discussion, we will refer to the companies that more than doubled per share earnings during the decade as the *standouts*. And the companies that increased per share earnings by from 67% to 100% will be called the *runners-up*. (Note: This study covers only those companies having published earnings as far back as 1949 in the C. A. Turner listings. This excludes about 20 utilities which otherwise might be candidates for the standout or runner-up categories.)

Unravelling the Figures: Biggest Gain in Southwest

Here is what a breakdown of the figures shows. First, five of the 13 standout companies (which more than doubled their earnings per share) are located in the thriving Southwest. The Southwest clearly is the blue-ribbon performer in terms of increased earnings per share during the Fifties. Here is a regional breakdown, showing the number of companies in each region that made a standout showing in per share earnings:

100% or better improvement in per share earnings in the Fifties

Southwest	South	Midwest	East	West
5	2	3	2	1

While the Southwest made the most spectacular gains in per share earnings in the standout group, the Midwest companies dominated the runner-up category, with seven companies in the list of 18. Here is a regional breakdown of the 18 runner-up (they pushed per share earnings upwards for a 10-year gain of from 67% to 100%):

67% to 100% improvement in per share earnings in the Fifties

Southwest	South	Midwest	East	West
2	3	7	4	2

How do these regional patterns for per share earnings growth compare with the pattern for price-earnings ratio growth? The figures below give the regional distribution of companies that (a) increased price-earnings ratios by more than 100%, and (b) increased price-earnings ratios by from 67% to 100% during the decade:

Price earnings ratio growth: (a) standouts, and (b) runners-up

	Southwest	South	Midwest	East	West
(a)	5	5	0	0	1
(b)	5	9	7	3	2

Notice the trend in the grouping of figures. In terms of increased *earnings,* the standout companies are concentrated in the Southwestern part of the country, with the Midwestern companies close behind. But in the runners-up category, the companies are concentrated in the Midwest and the East.

In terms of increased price-earnings ratios, the standout performers in PER-all bunched in the Southwest and South. But the runners-up in PER-growth are concentrated in the South and Midwest.

Top Emphasis Goes to Expanding Areas

As expected, the standout performers in both per share earnings growth and price-earnings ratio growth are companies located in the most rapidly expanding areas—the South and Southwest. The record of these companies stands out more clearly if we take the standout performers in both categories. That is, if we add, by regions, the number of companies that: (1) More than doubled their earnings per share in ten years, and (2) More than doubled their price earnings ratios in 10 years. There figures are shown (page 84), along with the totals for each region:

Earnings Per Share Grew 67% to 100% for These Utilities

COMPANY	PER SHARE EARNINGS 1949	1959	10-YEAR INCREASE	REGIONAL LOCATION
Virginia Electric Power	$0.86	$1.70	97%	South
Tucson Electric Light & Power	0.58	1.15	96	Southwest
Gulf States Utilities	0.68	1.36	96	South
Rochester Gas & Electric	1.52	2.90	91	East
Madison Gas & Electric	1.75	3.34	91	Midwest
Iowa Southern Utilities	1.17	2.20	88	Midwest
Baltimore Gas & Electric	0.76	1.41	84	South
Central Vermont Public Service	0.77	1.39	81	East
Pacific Gas & Electric	2.20	3.70	81	West
Consolidated Edison	2.22	3.92	76	East
Illinois Power	1.53	2.70	76	Midwest
Central Illinois Public Service	1.55	2.71	75	Midwest
Commonwealth Edison	2.13	3.65	71	Midwest
Southwestern Public Service	1.23	2.10	71	Southwest
Delaware Power & Light	1.88	3.20	70	East
Idaho Power	1.36	2.32	70	West
St. Joseph Power & Light	1.26	2.14	68	Midwest
Kansas City Power & Light	1.99	3.10	67	Midwest

Number of standout performers in earnings per share and price-earnings ratio

	Southwest	South	Midwest	East	West
EPS	5	2	3	2	1
PER	5	5	0	0	1
TOTALS	10	7	3	2	2

These totals are simply "weighted" performance figures which indicate the number of times companies are mentioned as standout performers in growth of earnings per share and/or price-earnings ratio. There are 17 mentions for the South and Southwest combined; only 7 mentions for the other three regions combined. This record for the South and Southwest is particularly outstanding considering that only 25 electric companies operate in these two regions combined. That compares with a total of 126 utilities which made up this study. Thus, a group that comprises less than 20% of the companies in this study has turned in more than 70% of the blue-ribbon performances.

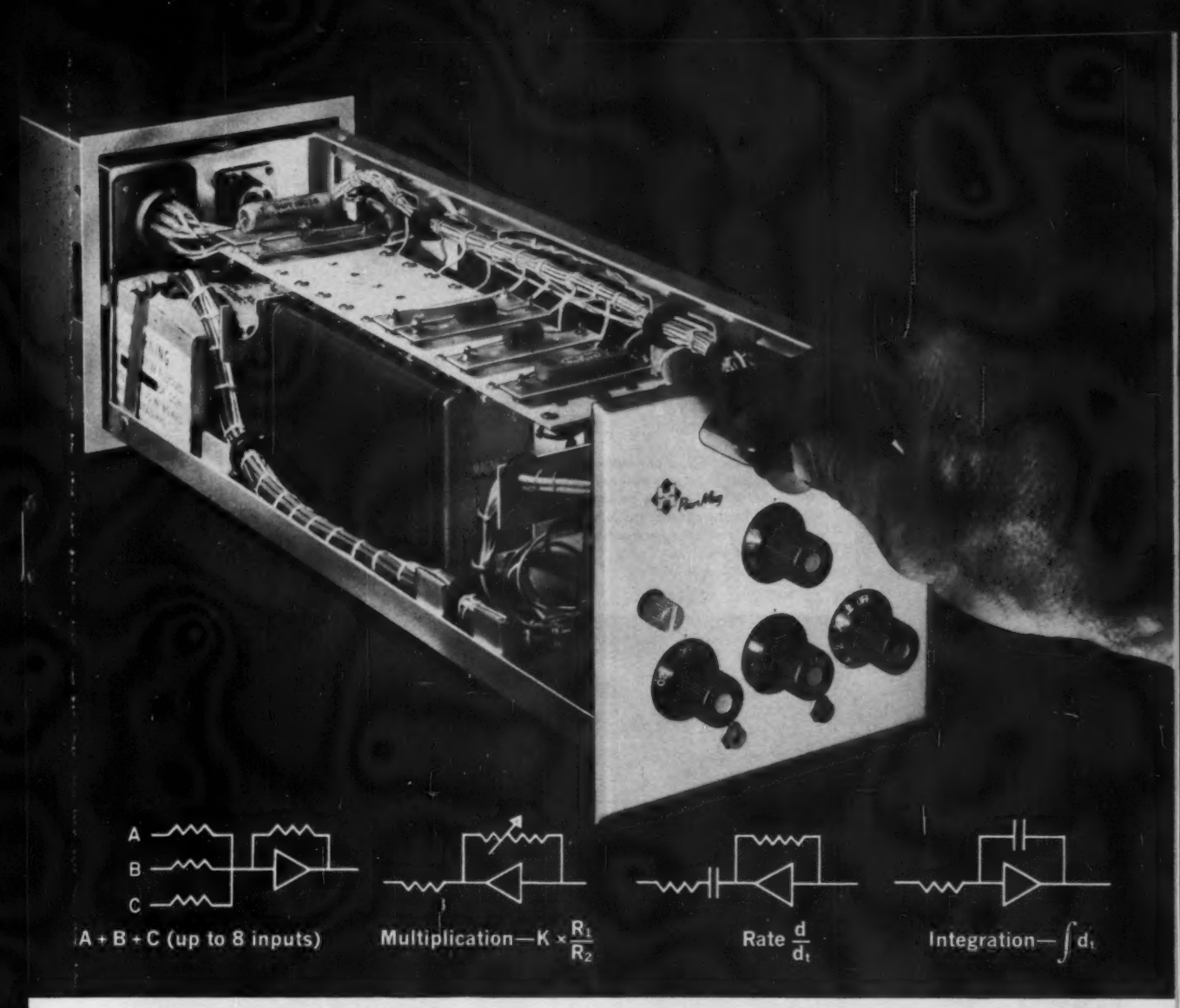
Aside from the standout gainers in per share earnings, it appears as though the Midwestern and Eastern utilities made the best performance. At least, it appears so from a casual glance of the earnings performance in the runners-up group (which increased per share earnings from 67% to 100%). Below the surface, however, this is not so. For while the largest *number* of runner-up companies are located in the Midwest, the largest *percentage* of runner-up companies in any one area again occurred in the Southwest, and by a considerable margin.

This is shown in the table below. It is based on the finding that: **(1)** 18 utilities made per share earnings gains of from 67% to 100% during the 1950's; and **(2)** the total number of companies surveyed was 126. The first line in the table shows the percentage of the 18 runner-up companies located in a given region. The second line shows the percentage of all companies appearing in a given region.

	Southwest	South	Midwest	East	West
% of all runners-up	22	12	34	22	10
% of all companies	8	14	35	26	17

Clearly, the standout region is again the Southwest, where the percentage of runner-up companies is nearly three times the percentage of companies in that region. Except for the West, where earnings of some Northwest companies may have been affected by federal power competition, the other regions show a rather striking similarity between the two percentages, which indicates that regional factors are of less importance in affecting earnings growth of the runners-up.

This completes our discussion of price-earnings ratio and earnings per share performance during the Fifties. A third, and final, article will discuss the payoff —the way PER and EPS actually affected market prices in the Fifties. It will appear in several weeks.



MAGNETICALLY—ONE CONTROLLER for all control functions

Hagan's PowrMag controller combines the kind of reliability required by industry with a flexibility of application that makes this one controller suitable for all control actions. Utilizing a high gain, operational magnetic amplifier, PowrMag can produce the full range of control actions by simple negative feedback through ordinary resistors or capacitors. These "passive network" elements are simply and easily plugged into the basic amplifier chassis by means of an integral plug-board, as shown in the photograph.

Here are some of the characteristics that make the PowrMag so valuable to a control system designer . . . Control signals—1 to 9 v DC *(no noise, capacitive loss or phase shift problems)*—Entire amplifier potted and then encased in steel *(virtually unaffected by environment)* — Utilizes unregulated 110 v AC power supply *(uses only 3 watts of power)* —Full integration action from a minimum change *(high sensitivity)* —Modular construction *(no inventory problems—each unit can perform any given function by a simple change of plug-in components)* — Each module is equipped with a pilot light to indicate fuse failure, test jacks to plug in an output meter, calibrated knobs for set point (bias), gain, reset and rate. Components can be replaced without a soldering operation *(minimum maintenance)*.

The Hagan PowrMag line includes the controller, remote control stations, patchboards for interconnecting the system, sensing elements and final operators. Why not phone or write for a Hagan engineer to give you all the facts on this remarkable system.

HAGAN
CHEMICALS & CONTROLS, INC.
HAGAN CENTER, PITTSBURGH 30, PA.

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This mark tells you
a product is made of
modern, dependable Steel.

Support structure

Dr. Harry Monson points to model of Experimental Breeder Reactor-II. Full size reactor towers over 100 feet into the air, looks like a huge silo with a domed top. The primary tank contains the reactor submerged in 80,000 gallons of sodium.

for atomic reactor designed with USS "T-1" Steel

A new Experimental Breeder Reactor (EBR-II) is under construction at the National Reactor Station near Idaho Falls, Idaho. This $29,000,000 project deals with the peacetime applications of atomic energy and may well show the way to an economical source of power.

This is the first nuclear reactor to have a completely integrated fuel processing plant. It will be a "closed cycle" power plant, where nuclear fuel will be employed to produce heat and at the same time "breed" additional fuel. The new fuel can then be processed into new fuel elements right in the EBR-II facility.

The longer you run, the more fuel you have. It's like putting 10 gallons of gas in your auto tank, then after driving many miles, to discover you have 14 or 15 gallons. That's how Dr. Harry O. Monson describes it. He is Project Engineer at the Argonne National Laboratory in Argonne, Illinois, where plans for construction of EBR-II were originally made.

Why USS "T-1" Steel was used.

Dr. Monson says, "It takes a strong, tough steel to support a 1,000-ton tank filled with 80,000 gallons of sodium—and "T-1" Steel is the best material we could find for columns, supporting beams and the central ring of this reactor vessel."

The bottom closure of the vessel is a solid reinforced concrete structure within which are embedded six channel beams tying together peripherally the lower ends of the columns. The top closure is tied to the bottom closure by six columns, 36″ wide, located about its periphery. These columns, as well as all the beams of the top and bottom closures, are fabricated of USS "T-1" Steel.

In addition to supporting the main structure, the "T-1" Steel also plays an important role in the reactor's primary containment system which is capable of withstanding, without breaching, an explosion equivalent to the detonation of 300 pounds of TNT. Such an explosion is judged to be the most serious consequence of unlikely events which might conceivably lead to an energy release in the nuclear core. To resist such an explosion, USS "T-1" Steel provides a high minimum yield strength of 100,000 psi. Yield strength of this magnitude provides a very substantial factor of safety.

Other uses for USS "T-1" Steel in construction.

The great strength of "T-1" Steel combined with weldability and high resistance to impact makes it widely used for heavy construction machinery, bridges, penstocks, pressure vessels, oil tanks and other structures where strength with least weight is desired. For complete information, write for our "T-1" Steel booklet. United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and "T-1" are registered trademark

Reactor under construction showing two of the six 36-inch columns welded from USS "T-1" Steel plates ranging from 1 inch to 5½ inches thick. 184 tons of "T-1" Steel were used in the structure for columns, channels, cylinders and rings. Fabricated by Nordberg Manufacturing Co., Milwaukee, Wisconsin.

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
National Tube—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

Cattle Buyers Now Buy and Sell in Comfort

Probably the cattle that are led to slaughter after a livestock auction will never be happy but customers at Jack Saules' livestock auction ring in Othello, Wash., are now more comfortable. Radiant electric heat has added a modern touch and now bidding goes on in comfort on cold days.

The problem before had been providing heat in the large, drafty and uninsulated structure used by Saules for the auction arena. Attendance dropped off during cold winter weather because customers were too uncomfortable.

Washington Water Power Co sales representatives stepped in and outlined to Saules the advantages of electric "spot" heating. They showed him where radiant units could be directed at specific areas of the arena with little or no waste. They pointed out heat was needed in two areas—the auctioneer's booth and the spectators' seating area.

Units totaling 2 kw were placed above and behind the auctioneer's booth. For the seating areas, cross-section sketches were made to arrive at the best locations and mounting heights. Units were then placed in rows coinciding with the seating arrangements at heights that were as low as comfort would allow. And the units were placed so that they would not obstruct views of the proceedings.

Total installation is 34 kw, with eight 3,600-w units, and several 2,000 and 1,100-w.

Conventional electric heating units were installed in other areas of the building. Fan-type heaters were installed in the restaurant and waiting areas, and wall units were placed in the office area. Total load outside the arena: 33 kw.

Home Builders Assn Aids Utility in Selling Medallion Homes

Consolidated Edison Co of New York is getting its Medallion Home Program off the ground through close cooperation with local home builders associations.

This year, the utility has joined with the Brooklyn Home Builders Assn to present a model home which displays a full array of modern conveniences and fixtures to help customers Live Better Electrically.

Last year, the utility joined forces with the Bronx Home Builder Assn. In July a third home was opened on Staten Island as a result of this builder-utility relationship.

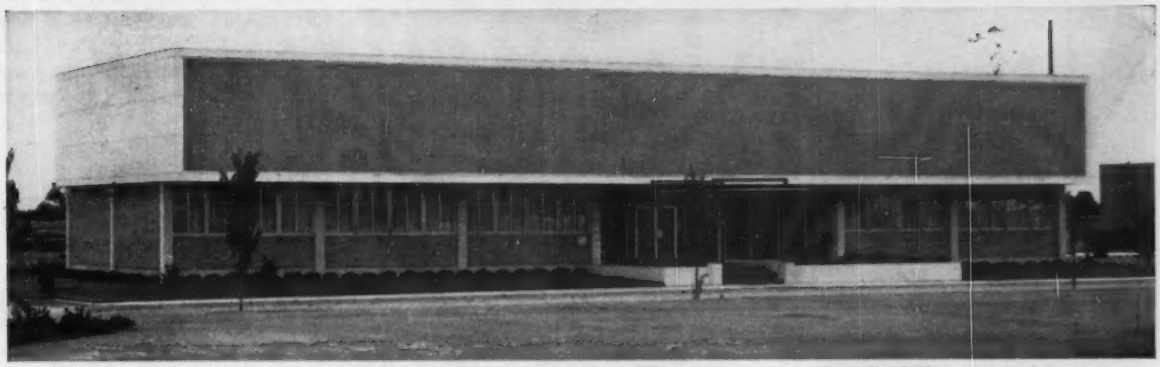
Each house was planned for a development area—an area where residents already would be living while new homes were going up. The model home served as an influencing example for a prospective home owner who could then instruct the contractor on how he wanted his house outfitted and equipped. The home also served as a comparison with the homes already built and occupied. The model home is ultimately sold at a price competitive with those on the local market.

No effort was made to make the model home "extraordinary" in a price-tag sense.

The homes in each case are fully owned by the home builders associations.

The model homes are an outgrowth of a relationship established between the associations and Con

"1240 of our customers became bigger users..."



Delta Electric Power Association, Greenwood, Mississippi. Their two-month electric skillet promotion this summer resulted in sales that are expected to boost annual power revenue by $5,580.00.

Sales Manager Robert L. Shuler reports: "1240 of our 5639 residential customers bought skillets during our summer campaign."

W. D. Henard, General Electric Field Representative, provided Delta with a custom-made program designed to meet local problems.

New General Electric Tip-Top Skillet with retractable "fifth" leg and 2-position removable cover was featured in Delta Electric Power Association's self-liquidating skillet promotion. Each General Electric skillet sold added approximately $4.50 a year to the utility's revenues.

For full information on how General Electric's Power-Use Program can help you, write Merchandising Section 22CE, Portable Appliance Department, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

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BEST QUALITY!
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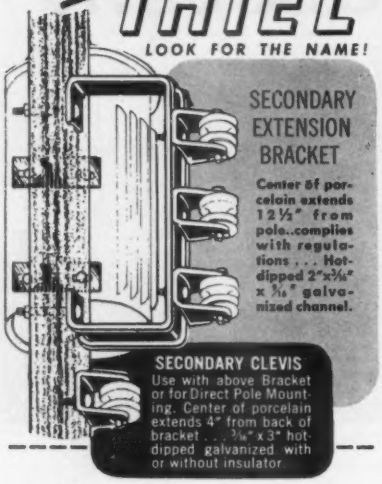
LOOK FOR THE NAME!


SECONDARY EXTENSION BRACKET
Center of porcelain extends 12½" from pole..complies with regulations . . . Hot-dipped 2"x⅜" x ⅛" galvanized channel.
SECONDARY CLEVIS
Use with above Bracket or for Direct Pole Mounting. Center of porcelain extends 4" from back of bracket . . . ⅜" x 3" hot-dipped galvanized with or without insulator.

Transformer Adaptor Plates
FOR DIRECT POLE MOUNTING
Mount O.S. Transformers directly to the pole with 2 thru bolts . . . Cross Bar and Channel Function are welded . . . Plates and Bolts are hot-dipped galvanized.

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Edison. Representatives of the utility are members of each association and work with the builders to help them where they can.

The association contacted equipment and lighting manufacturers to participate in outfitting the home, Con Edison talked with prospective new home owners to find out what features were most desirable in a new home.

In each model home Con Ed used trained personnel to describe the advantages of the installed equipment and fixtures. Home service women, kitchen planners, and specialists in electricity, heating and air conditioning were on hand at all times and have been staked out at the model homes for as long as three months.

When the display period is over the home building association sells the home fully equipped.

NRECA Plans $10 Million Appliance Promotion

National Rural Electric Cooperative Assn is planning a $10-million electric appliance promotion for 1961.

Promotions are aimed at creating a desire for members to live better electrically, making it easier for members to buy appliances, and getting wiring updated.

Incentives include appliance preiums, cash payments to members, free wiring and other inducements.

Specific promotions include laundry and water heaters, February and March; refrigerator-freezers and air conditioning, May 15-July 15; ranges and all electric kitchens, August and September; small appliances, Oct. 15—Dec. 15; electric heating, all year; water systems, March, April and May, and September and October, and Light For Living, January, February and March, and September, October and November.

Mineral Wool Assn Has Slide Film

Slide film on installed performance standards for house insulation has been prepared by National Mineral Wool Assn. "Eliminating the Guesswork" can be used by electric companies, electric heating equipment manufacturers, distributors, contractors. Purpose of 25-minute film: To show that insulation is not a "problem" but an asset in promoting electric heating.

Film explains, in laymen's terms, how to figure insulation on the basis of NMWA's new "R" standard, which supplants the 6-4-2 formula with an exact standard that takes advantage of the insulating value of building material surfaces and adjoining air spaces in ceilings, walls and floors. Prints are available from National Mineral Wool Assn, 1270 Sixth Avenue, N.Y. 20, N.Y. at $20 each.

SELLING BRIEFS

Business management seminars are being offered to area appliance dealers, electrical contractors and electrical trade allies by United Illuminating Co. Course, given in co-operation with University of Connecticut, will cover: Credit and service, advertising, financial management, merchandising, market analysis, analysis of retail operations, management techniques. Aim: To build healthy retail appliance and electrical contracting businesses.

Nation-wide promotion "Make Your Home Happier With A New Appliance" will be launched in November. Campaign is sponsored by Bureau of Advertising, American Newspaper Publishers Assn, Newspapers Advertising Executives Assn and American Assn of Newspaper Representatives. Leading manufacturers and utilities will tie in.

Kansas is one of first states to raise its official **school lighting** standards. Ratings were developed according to findings of the Blackwell Report, and are being published in a book, "Artificial Lighting For Modern Schools," prepared by George W. Reida, Director of School Facilities Section, State of Kansas. Book is intended as a guide for school officials, architects, engineers, and others interested in school lighting.

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plus, time-lag to prevent needless blows
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Prevent damage to Panelboards, Controllers or other circuit components. Let-thru currents are limited to exceptionally low values.

Can be easily coordinated into a selective system —to limit fault outages to circuit of origin.

Prevent waste of time and money—because long time-lag keeps them from opening needlessly on harmless over-loads.

Permit increasing interrupting capacity and current limitation on present system at minimum cost. Fuses fit standard switches and panelboards. Available from 15 to 600 amperes in both 250 and 600 volt ranges.

Remain safe throughout the years without maintenance or recalibration.

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Sillin Named President of Central Hudson

Ernest R. Acker has been elected chairman of the board of Central Hudson Gas & Electric Corp while Lelan F. Sillin Jr will succeed him as president.

John Wilkie has been named vice chairman of the board, and Jack A. McEnroe, treasurer.

Acker, who had been president and general manager since 1932, will continue to serve as the company's chief executive officer. Wilkie will be the chief financial officer.

Associated with Central Hudson since 1919, Acker has been a member of the board of directors since 1926. He is also a director of Edison Electric Institute.

Sillin succeeds to the presidency after serving as assistant general manager for the past seven years and as a vice president and director since 1955. He joined the company in 1951 as secretary and assistant treasurer.

ACKER SILLIN

Before that he was associated with the New York City law firm of Gould & Wilkie, Central Hudson's general counsel.

Randall Appointed VP-Purchasing

Cleal F. Randall has been appointed vice president, purchasing and inventory control of Anaconda Wire & Cable Co. He will have executive responsibilities for purchasing, traffic, warehousing, customer services, packaging production planning and inventory control.

Randall joined the company in 1929 as credit and office manager in Chicago. He was promoted to assistant treasurer in 1940, and became manager of production planning in 1954.

Before joining Anaconda Wire and Cable Co he was an accountant for five years with the parent company, The Anaconda Co.

◀ CLEAL F. RANDALL

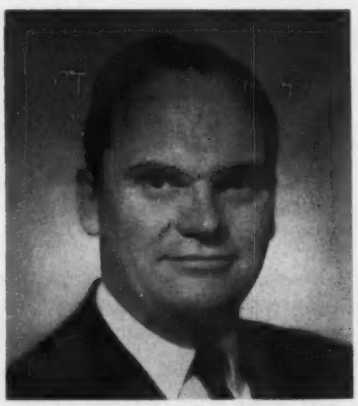
IT&T Names Stevenson a VP

Ward B. Stevenson has been appointed vice president-public relations of International Telephone & Telegraph Corp.

He joins the firm from General Public Relations Inc where he had been president since its formation in 1957 as a subsidiary of Benton & Bowles, advertising agency.

He joined the agency in 1955 as vice president in charge of public relations.

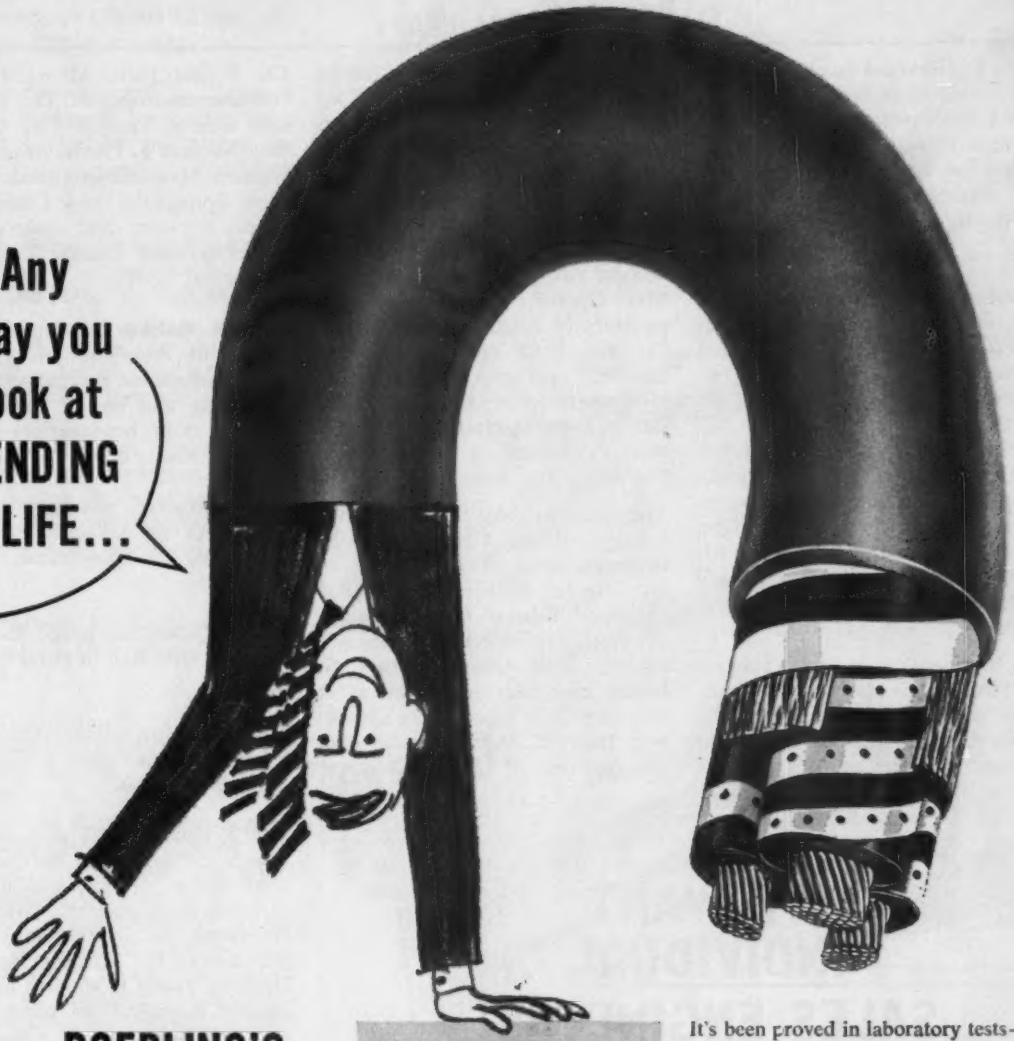
From 1943 until he joined B&B he served in various industrial and public relations capacities with Pillsbury Mills in Minneapolis. He has also been with the Coca Cola Bottling Co and the Associated Industries of Minneapolis.



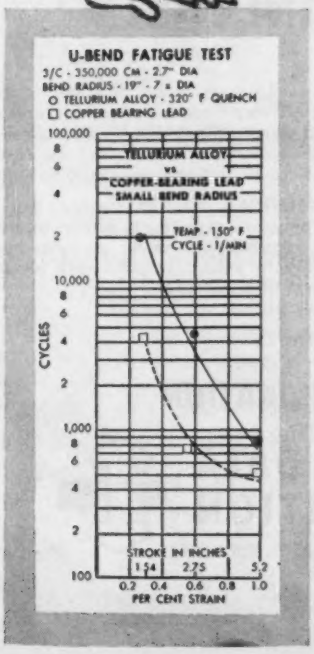
WARD B. STEVENSON ▶

(*More News About People on page* 94)

Any way you look at BENDING LIFE...



ROEBLING'S TELLURIUM LEAD ALLOY SHEATH LASTS 4½ TIMES AS LONG!



It's been proved in laboratory tests—the Tellurium Lead Alloy Sheath on Roebling Paper Power Cable has *4½ times more bending life* than copper bearing lead sheath! What's more, tests (and experience) prove this sheath has outstanding stability under heat... unusual resistance to age hardening... negligible creep rate at 200 psi, 150°F.

The paper power cable inside matches the extra quality of the sheath. And that's the whole story—there's simply no better cable buy, when the cable you use has to last, then last some more!

Test data and an informative folder about the exceptional properties of this sheath are available. Write: Electrical Wire, John A. Roebling's Sons Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation

Roebling electrical wires and cables are available with either copper or aluminum conductors.

David E. Gervenak has been named superintendent of West Penn Power Co's Connellsville and Lake Lynn power stations. Also, **Daniel W. C. Molter** has become assistant to the vice president—power, and **James E. Davis,** chief mechanical engineer.

Theodore W. Fryou, treasurer and controller of Portland General Electric Co, has been elected president of the Portland Control of Controllers Institute of America. At Iowa's Control, **Marshall G. Hardesty,** treasurer of Iowa Electric Light & Power Co, was chosen president; **Ralph L. Meyer,** controller of Iowa Power and Light, secretary-treasurer; and **Karl M. Torgerson,** head of Iowa P&L's Audit & Procedures Division, was added to the Control board.

New president of the Dallas Control is **William H. Harrison Jr,** controller of Texas Electric Service Co. **Victor Lota,** assistant secretary and assistant treasurer of New Orleans Public Service Co, has been named a director of the New Orleans Control. **Eldred H. Scott,** vice president and controller of Detroit Edison Co, will head the Detroit Control for 1960–'61. **Horace H. Ferrin,** vice president and treasurer of Oklahoma Gas & Electric Co, has become vice president of the Oklahoma Control. **Francis W. Smith,** secretary of Arizona Public Service Co, has been elected secretary-treasurer of the Arizona Control. New treasurer of the Boston Control is **John Maclachlan,** secretary and comptroller of New England Gas & Electric Assn.

The following have been named directors of local Controls: **Roy N. Dreiman,** assistant comptroller of Pacific Gas & Electric Co, San Francisco; **Edward Gardner,** assistant controller of Niagara Mohawk Power Corp, Albany; **Arthur G. Green,** controller of Columbus & Southern Ohio Electric Co, Columbus; **Harry C. Johnson,** controller and treasurer of Otter Tail Power Co, Fergus Falls, Minn.; **J. Paul O'Brien,** controller of The Cincinnati Gas & Electric Co., Cincinnati; **Norman F. Plante,** treasurer of Western Massachusetts Electric Co, West Springfield; and **Clifford N. Wade,** treasurer and controller of The Patchogue Electric Light Co, Patchogue, N. Y.

John N. Rolston has joined Commonwealth Associates Inc as business development representative for consulting and design engineering services, with headquarters in the Jackson, Mich., office.

L. C. Walker, manager of the Earl office of Arkansas Power & Light Co, has been transferred to Brinkley.

Edward Allen has joined the merchandise sales staff of Potomac Edison Co.

New supervisor of market analysis for the Dayton Power & Light Co is **Louis C. Cobb.**

The following shifts in Commonwealth Edison-Public Service Co's construction, service, and division activities have occurred: **Ralph G. Raymond** has been named vice president of PSC's Illinois Northern Division; **James I. Mitchell** has succeeded Raymond as construction manager; **Lawrence B. Cappa** has become director of general service for Commonwealth, in Chicago.

C. A. Thrasher has succeeded **Charles B. Olds** as superintendent of electrical and steam heating sales of the Akron Division of the Ohio Edison Co. Olds has become Alliance Division manager.

Alton E. Calhoun has been named right-of-way engineer in Louisiana Power & Light Co's Northern Divisions, succeeding the late **Porter Barton Jr. Willie T. Hinton Jr** has replaced Calhoun as foreman of the division's tree-trimming crew.

Virginia Electric & Power Co has made the following promotions: **S. Harold Fletcher,** assistant personnel manager; **Floyd L. Gibbs,** Richmond district manager; **James S. Hamilton,** Fredericksburg district

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manager; and **Charles L. Sale,** Albemarle district manager.

Assistant Communication Engineer **A. B. Buchanan** has retired from Detroit Edison Co to form an independent engineering consultant practice.

Neil J. Mahar has retired as project builder representative for Washington Water Power Co at Spokane.

Harry M. Jones has retired as superintendent of electrical operations of Idaho Power Co.

New chairman of the electrical engineering department at the Missouri School of Mines and Metallurgy is **Dr Roger E. Nolte,** succeeding **Prof I. H. Lovett** who has retired.

Rufus Moses, Youngstown Division manager of Ohio Edison Co, has retired.

A new marketing program has been established for the Micarta Division of Westinghouse Electric Corp, headed by **J. G. Wynn.** Assisting him will be **R. J. Harden,** negotiations supervisor; **M. F. Hertel,** technical service engineer; and **David Hodowanetz,** technical service engineer for finishes; and **C. W. Anderson,** negotiations correspondent. **Dr Clinton R. Hanna,** associate director of Westinghouse Research Laboratories has retired. **Reuben Lee,** consulting engineer, Electronics Division, has been given the Order of Merit, the company's highest award, in recognition of notable technical accomplishments including the development of the first radar pulse transformer.

General Electric Co has named **Mark M. Patterson** power plant application engineer for the Power Plant Engineering Operation, and **Alfred G. Mellor,** project engineer. **Harry G. Harder** has retired as manager of power operations in the company's irradiation processing department at Hanford Works, Richland, Wash., and **Charles Bohan** has retired as manager of the X-ray district office in Oklahoma City, Okla. **J. Edwin Godfrey** has been appointed manager-original equipment manufacturers sales: **W. W. Smith,** manager-California plant, distribu-

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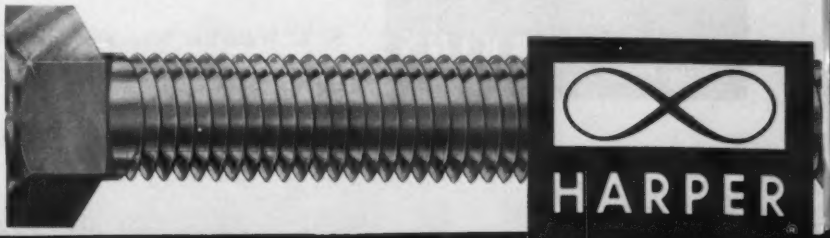

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Portable hand-crank generator model weighs 31 pounds with leads stored in case. Plug-in panel-mounting model available for transformer manufacturers and repair shops.

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tion assemblies dept, **Robert B. Kurtz,** general manager, general purpose control department; **Richard L. Heckman,** advanced product planning specialist, and **Malcolm G. Doyle,** product planner for appliance, heating and special purpose controls, appliance control department; **George A. Cole,** manager product planning and market research, industry control department, succeeding **Joseph S. Quill,** now consultant for advanced marketing development in the advanced product planning operation, Electronic Components Division.

R. W. Hodgers Jr has been named manager of engineering for GE's X-ray department, succeeding **M. A. Edwards** who has become manager, advanced product planning, Electronic Components Division. **Leslie L. Alt** has been made a physicist in the advanced semiconductor laboratory; **Carl N. Brown,** manager of the Campinas Plant in Brazil; **James J. Farrell,** southern regional sales manager, distribution transformer department; **Edward M. Cushing,** equipment application specialist in the transformer department, **Dr Thomas M. Snyder,** manager of physics at GE's Vallecitos Atomic Laboratory, has been elected chairman of the Northern California section of the American Nuclear Society.

John F. Van Landeghem has been appointed Eastern regional manager for Chase Brass & Copper Co; **Ralph H. Stroth,** product manager for sheet and strip; **Homer D. Gebauer,** district manager in Pittsburgh; **Charles A. Festge,** manager of the district office and warehouse in Milwaukee; **Thomas E. Cox,** district manager in Waterbury, Conn.; **Charles L. Moseley,** special accounts executive for the Eastern sales region; and **Eugene J. Wasilewski,** district manager, Charlotte, N. C., and **David M. Andrews,** director of production planning and control.

Thomas E. Clemmons has been appointed director of advanced studies by International Business Machines Corp.

S. T. Walz has been made Southeastern region manager of Square D Co.

Return Tests Plant Design

(*Continued from page 55*)

tabular form, using graphical values of ϕ.

This example will illustrate the use of gross return at the end of a plant's first year in estimating whether the net rate of return over the plant's life will match the required net return. Assume a plant improvement, which is to be depreciated over a 33-year expected life, with salvage value equal to the cost of dismantling and removing. The variation of the unit capacity factor with time, as given by the utility, is represented by Fig 1. Expected life (L) = 33 years; depreciation (d) = 3%; local taxes and insurance (t) = 1.4%; interest (3% on bonded ratio of 50%) (i) = 1.5%; federal tax (T) = 52%; required rate of return (r) = 6%; predicted fuel cost increase = 1% per year. Applying equation (1):

$$S = 0.1527(I)$$

In other words, to realize a 6% return over the life of the unit, the gross return must be about 15.3%. Listed in the table are the effects of the principal variables. Column 2 lists the fuel saving; capacity factors are in column 3; present worth factors are in column 4; and corrected present worth factors are in column 5. Summing the values in column 5, and applying equation (3) gives:

$$S/I = 0.1994$$

Or, to realize a 6% net return over the life of the equipment, as it will be used, requires that the gross return at the end of the first year be almost 20%. Columns 4a, 4b, and 4c were computed for rates of return of 2.03%, 3.67% and 10%, respectively. Columns 5a, 5b and 5c list corrected present worth factors. From data in the table, Fig 2 was plotted.

To show how this information may be used, let it be assumed that the results of two heat balances show an improvement of one over the other of 140 Btu kwhr; capacity 140 Mw; fuel cost 30¢/million Btu; fuel cost increase is 1% per year; and 8,000 hr of full-load operation constitutes 100%. Then:

$$S = 140{,}000 \times 140 \times 8000 \times 0.30 \times 10^{-6} = \$47{,}000$$

From Fig 2, for a net return of

6%, the first year gross return must be 19.94%. The maximum incremental investment will therefore be:

$47,000/0.1994 = $236,000

If the economic study shows that the actual incremental investment required will be $310,000, then the first year gross return would be:

47,000/310,000 = 15.15%

From Fig 2 the actual net return is shown to be only 3.9%.

Installs Card System

(*Continued from page* 60)

system would help considerably in such areas as construction cost accounting, material records and payroll distribution. It would also provide a more efficient means of recording capital credits and would prepare automatically the thousands of checks required to disburse capital credits.

The cooperative decided to rent the equipment. By this method the machines, as well as the cost of operation, including maintenance, insurance, depreciation, taxes, and machine replacement, are taken care of automatically by the machine company. When the rental cost was spread proportionally among the various departments, it was found that the increased cost to each department was reasonable.

Now, each week department heads come up with new ideas for the machine to provide additional information and service. The cooperative feels that in less than two years it will be utilizing the equipment to its fullest capacity and may even be increasing the machines' speed ratio from their present 650 cards per min rate to produce more work in the same amount of time.

Urge Automatic Rate Hikes

Utilities should collect rate increases automatically if the Ohio Public Utilities Commission fails to act upon rate requests within six months, spokesmen for utilities told a legislative study committee recently.

Complaining about delays involved in deciding cases, the spokesmen said their plan would speed PUC processes without the need of additional personnel.

CONVERTING?

Use General Electric replacement parts in your transformer rebuilding program

Utilize your old or obsolete distribution transformers by rebuilding with General Electric's complete line of renewal parts. You can rebuild to match converted-system voltages, increased kva ratings and change transformers from conventional to self-protected units quickly and economically.

When distribution system voltages are increased you can uprate from 2400 to 7200 or 7620 volts (for example) and take advantage of modern voltages with minimum expense for transformer rebuilding. Moreover, an old 5-kva, low-voltage unit can now typically be uprated to 16.8 kva by utilizing a Permalex* core and coil.

Protective devices—such as Magne-valve lightning arresters and circuit breakers—permit inexpensive modernization from conventional Type HS transformers to HSBA self-protected models.

Rebuilding can be done by one of the 55 General Electric Apparatus Service Shops or in your own repair shop. For complete details about modern distribution transformer rebuilding, see your G-E Sales Engineer or the Representative from your General Electric Service Shop. General Electric Co., Schenectady 5, New York. 485-04

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2—1500/1875 KVA Mol. 3-Ph. 40,500—4800 F/C equipped
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47 Years' Dependable Service

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TRANSFORMERS

QU.	KVA	MFG.	VOLTAGE
1	12000	G. E.	115,000—46,000 L. T. C.
1	5000	West.	115,000—13,750, 3 Ph.
1	10000	West.	67,000—34,500, 3 Ph. Auto.
1	3750	G. E.	69,300—13,200, 3 Ph.
1	3000	G. E.	69,000—4340, 3 Ph.
4	2000	Amer.	67,650—22,000
3	1250	G. E.	69,300—2400/4160
3	500	G. E.	66,000/33,000—2300/13200
1	2500	Mol.	44,000—2400/4160, 3 Ph.
2	2500	Wagner	45,000/22,900—4160Y, 3 Ph.
1	5000	West.	34,500—13750/6875, 3 Ph.
1	4500	West.	35,000—2500/4330, 3 Ph.
2	3000	Upgf.	34,750—4160, 3 Ph.
1	2000	Kuhl.	34,650—440, 3 Ph.
2	1500	G. E.	34,400—2520, 3 Ph.
3	1250	A. C.	33,000—480
3	500	Mol.	34,500—2300/4600
3	200	A. C.	34,500—2400/7200/12470Y
2	3000	G. E.	26,400—4160Y/2400, 3 Ph.
3	1250	G. E.	29,340—2500
2	3000	G. E.	13,800—2640, 3 Ph.
1	2500	G. E.	13,800—2400, Unit Sub.
1	600	Stand.	13,200—2300, 3 Ph.
3	500	G. E.	13,200—240 x 480
1	450	Penna.	13,200—2400, 3 Ph. Askarel
3	333	G. E.	13,800—230/460
3	100	A. C.	6,900—2400
1	500	Kuhl.	4,800—480, 3 Ph.
1	1000	A. C.	2,400/4,160—240, 3 Ph.
3	400	G. E.	2,300/4,000—230/460

FREQUENCY CHANGERS

1	4600 Kw, 60 cycle, 13800 volts, Generator 6500 Hp, 25 cycle, 11000 volts, Motor—300 Rpm
1	1500 Kw, 60 cycle, 2300 volts, Generator 2100 Hp, 25 cycle, 2300 volts, Motor—300 Rpm
2	1000 Kw, 60 cycle, 2300 volts, Generator 1580 Hp, 25 cycle, 2300 volts, Motor—300 Rpm

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BREW, WOLTMAN
& CO., INC.
52 Church Street, New York 7, N. Y.

SWITCHGEAR ENGINEER

AGE: To 45 years

EDUCATION: B. S. E. E. minimum

EXPERIENCE: 5 years in 5 & 15 KV metalclad switchgear application; engineering background should include some design or development work.

Challenging Position—Unlimited Potential

Send Complete Resume

Including Salary Requirement

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Meetings Calendar

OCTOBER

• **National Society of Professional Engineers**—Fall Meeting, Statler-Hilton Hotel, Denver, Oct. 19-21.

Edison Electric Institute—Electrical Systems & Equipment Committee, Hotel Northampton, Northampton, Mass., Oct. 16-18; Sales Division Executive Committee, New York City, Oct. 18-19; EEI Statistical Committee, The Homestead, Hot Springs, Oct. 27-28.

• **National Rural Electric Cooperative Association**—Region 10, Dallas, Oct. 20-21; Region 5, Springfield, Oct. 27-28; Region 6, Minneapolis, Oct. 31-Nov. 1.

Pennsylvania Electric Association—Systems Operation Committee, Castleton Hotel, New Castle, Oct. 20-21; Prime Movers Committee, Split Rock Lodge, White Haven, Oct. 27-28.

Southeastern Electric Exchange—Engineering & Operation Section, Shoreham Hotel, Washington, D. C., Oct. 20-21.

Electric Companies Public Information Program—Second National Youth Conference on the Atom, Museum of Science & Industry, Chicago, Oct. 20-22.

American Standards Association—National Conference on Standards, Sheraton-Atlantic Hotel, New York City, Oct. 25-27.

National Association of Corrosion Engineers—South Central Region Conference, Mayo Hotel, Tulsa, Okla., Oct. 25-28.

Armour Research Foundation of Illinois Institute of Technology—Computer Applications Symposium, Morrison Hotel, Chicago, Oct. 26-27.

Association of Edison Illuminating Companies—Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., Oct. 26-29.

• **Canadian Electrical Association**—Western Zone Engineering Sections, Regina, Oct. 27-29; General and Sales Sections, Calgary, Oct. 31-Nov. 2.

• **American Power Dispatchers Association**—Fall Meeting, Glendale, Calif., Oct. 28-29.

Institute of Radio Engineers—Fall Meeting, Syracuse Hotel, Syracuse, Oct. 31-Nov. 2.

NOVEMBER

• **Public Utilities Association of the Virginias**—Accident Prevention Round-Table Conference, Roanoke, Nov. 2.

• **Edison Electric Institute**—EEI-AGA Taxation Accounting Committees, The Cloisters, Sea Island, Ga., Nov. 2-4; Area Development Workshop, Park Plaza Hotel, St. Louis, Nov. 15-16; Commercial Cooking and Water Heating Committee, New York City, Nov. 15-16; Electronic Seminar, Atlantic City, Nov. 28-30; Street & Highway Lighting Committee, Cincinnati, Nov. 30-Dec. 1.

• **Pennsylvania Electric Association**—Relay Committee, Hotel Brunswick, Lancaster, Nov. 3-4.

• **New Jersey Utilities Association**—Annual Meeting, Seaview Country Club, Absecon, Nov. 9-10.

• **American Institute of Electrical Engineers**—Power Industry Computer Application Conference, Chase Hotel, St. Louis, Nov. 9-11; Sixth Annual Conference on Magnetism and Magnetic Materials, Hotel New Yorker, New York City, Nov. 14-17.

• **Mid-America Electronics Conference**—Hotel Muehlebach, Kansas City, Nov. 14-16.

• **Southeastern Electric Exchange**—General Sales Conference, Henry Grady Hotel, Atlanta, Nov. 16-18.

• **National Electrical Manufacturers Association**—Annual Meeting, Savoy Hilton Hotel, New York City, Nov. 17.

• **Canadian Electrical Association**—Engineering Sections, Western Zone, Saskatchewan Hotel, Regina, Sask., Canada, Nov. 17-19; General & Sales Sections, Western Zone, Palliser Hotel, Calgary, Alta., Canada, Nov. 21-23.

• Additions this week.

Electrical World's Second Street and Highway Lighting Conference—Hotels Ambassador, Chicago, Ill., Oct. 19-20.

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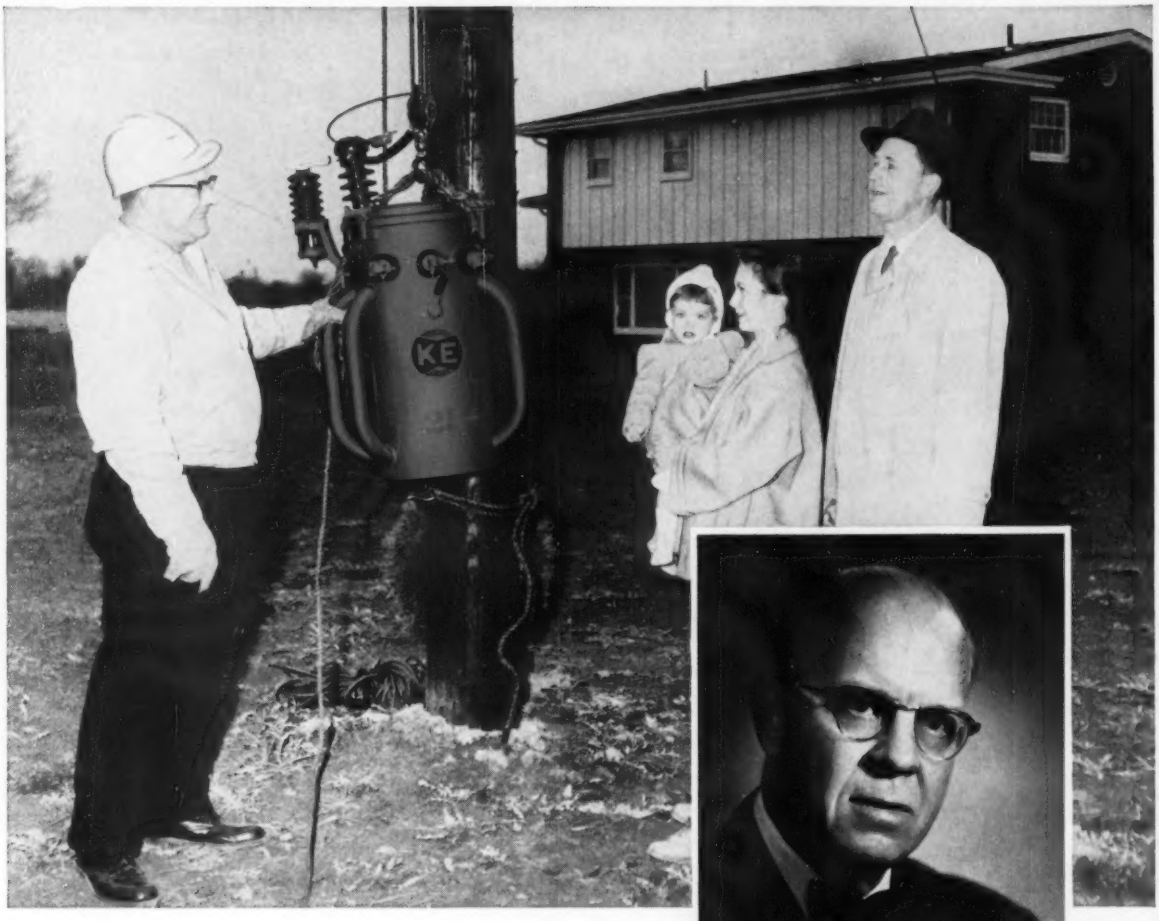
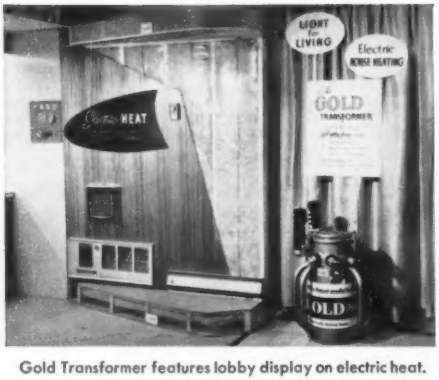


Gold Transformer is hoisted into position at new electrically heated home. L. to r.: Jack Roland, DP&L lineman; home owner, Mrs. John Roschi, and daughter; Charles Hedges, DP&L Builder Sales Specialist. (At right) E. J. Rommel, vice president and commercial manager, DP&L.

Dayton Power and Light installs GOLD TRANSFORMER to serve a new electrically heated home



Gold Transformer features lobby display on electric heat.

"The Gold Transformer promotion is an integral part of DP&L's 'Sizzling '60' Sales Program," states DP&L's E. J. Rommel. "We set a 1960 goal of 175 new electrically heated homes, and progress to date indicates we will exceed that number by a substantial margin."

The bright Gold Transformer, symbol of all-electric living, identifies and dramatizes Gold Medallion homes, builds interest and traffic for these showplace dwellings.

Ask your Kuhlman representative for full information about Kuhlman's Gold Transformer merchandising kit. It will help you use Gold Transformers for greater Gold Medallion sales.

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